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By L. H. Bailey

Species Batorum.

The Genus Rubus in North America

I

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1. THE BIENNIAL SUCCESSION. Blackberry plant showing primocane at right and floricane in bloom at left. Separate leaves ($\times \frac{1}{3}$) are a 5-foliolate at left from primocane, and 3-foliolate from floricane at lower center. One of the Arguti.

Gift
L. H. Bailey
3-25-1941

SPECIES BATORUM.
THE GENUS RUBUS IN NORTH AMERICA
(north of Mexico)

I

It is common opinion that Rubus is botanically the most difficult genus in North America, particularly in respect to the native blackberries. Two reasons are mainly responsible for this attitude: prejudice against understanding the plants; lack of field experience and of adequate herbarium materials. When these defects are corrected, the genus lends itself readily to systematic study.

Scraps of specimens without annotations are mostly hopeless, particularly when the possessor of them does not know the plants to which they belong. As such collections have accumulated, the practice has developed of assuming that what is not clear is the fault of hybridity, and confusion has thereby been multiplied. No other North American genus has been treated so shiftily.

Much of the difficulty in understanding Rubus is due to the admixture of forms in clearings, abandoned quarries, burned-over fields, and similar places where invading vegetations have not become stabilized and the less adapted elements are not yet defeated. These areas appear to be full of nondescript Rubi, as if they were hybrids and incapable of definition. These cases are clarified when one recognizes the fact that about one hundred and fifty species of American birds feed on the fruits of Rubus: one would expect such medleys in any areas adapted to receive them, although the extent of actual propagation of species by these means yet awaits investigation. The fact that one does not recognize the forms only means that the species of the neighborhood are not understood by the observer.

I find a strange reaction among collectors to the effect that when two or more species of Rubus grow together in a small area they must therefore be variants of one another or hybrids; yet the same area may support a dozen kinds of grasses or several species of ferns and no questions are raised. In a certain place two species of blackberries grew together, to the confusion of the collector; yet there was no confusion because *Impatiens pallida* and *I. biflora* were side by side in the same locality. In a wild place about fifty miles from my home *Rubus canadensis* and *R. allegheniensis* are intertangled over a considerable area, as if they came from common roots; yet several hours of digging out the bushes by two of us disclosed the

root systems to be completely separate and distinct; the plants had grown from seeds, undoubtedly dropped on the clearing by birds (Gent. Herb. ii, 373). Before me is a sheet of *Carex oxylepis* collected by Svenson in Alabama with statement that the plant was growing with *C. blanda, C. cherokeensis, C. flaccosperma, C. Willdenovii;* we do not offer such information on labels of Rubus.

Collectors have mostly taken Rubus along with other plants in general field work or have satisfied themselves with uncritical materials in herbaria or within a particular territory. Result is that Rubus has been the most neglected of any of our large and widespread genera. A genus is not understood until it is collected.

History

Only one monograph of North American brambles has appeared, that by Rydberg in 1913 in North American Flora. This study did not assemble many new personal specimens or develop improved methods in collecting. It carried the hybridity assumption to its highest point in this country, particularly in the Eubati of the United States, of which there were enough poor specimens to be puzzling. That monograph remains, however, an invaluable repository of classification, reference and information, and it is the standard work on the tropical species of its territory.

Focke in his world monograph, Species Ruborum, beginning in 1910, included North American species but his material for the occidental blackberries was inadequate and his treatment of them was naturally uncritical.

Most of the other discussions of North American Rubi have been partial, regional, or floristic, and have not analyzed the types of early authors.

Linnæus founded three species from North America, *R. canadensis, R. occidentalis, R. hispidus.* His *canadensis,* although abundant and conspicuous over a wide territory, was misunderstood for nearly one hundred and fifty years; examination of the Linnæan specimen by Bailey in 1897 was an early attempt by an American to determine type material of our species. By an unexplained confusion, some of the Linnæan material of *occidentalis* is not the plant he described (Gent. Herb. i, 147, 1923). His *R. hispidus* has been rather accurately understood, although the specimen represents the coarse rampant form of the species.

The fourth species founded for North America was *R. parvifolius,* Walter 1788, a name applied to an oriental species by Linnæus in 1753, whereupon Pursh in 1814 renamed the occidental plant *R. cuneifolius.* In 1789 Aiton described *R. villosus,* which was consistently misinterpreted by everybody for more than a century, was misjudged by Bailey in 1898 because a species to match it had not then been recognized in North

America; finally identified (probably correctly) by Blanchard[1] as his *R. plicatifolius*. The name is now eliminated from our flora by the earlier *villosus* of Thunberg, under present Rules of Nomenclature. This brings us to the close of the eighteenth century.

A few species were founded by Michaux in 1803, two by Pursh in 1814; small innovations were made early by Willdenow, Link, Trattinick, Chamisso & Schlechtendal, and by Jacob Bigelow in Boston. Then, as far as the blackberries are involved, followed the silence of more than a half century.

The great authors of the past century on whom rested the modern development of our flora did not attack the blackberries by founding new species, not until Britton in 1891 described *R. Millspaughii* which was first recognition of the plant known to Linnæus as *canadensis*, although Bailey in 1890 had described a variety of what was then called *villosus* but is now known as *flagellaris*. In 1891, also, Peck had described a var. *suberectus* of *R. hispidus* which we now recognize as a member of the Setosi; Torrey and Gray in 1840 had transferred Bigelow's *setosus* to *hispidus*, and they had made a var. *humifusus* of *R. villosus*, a reference that bothers us to this day.

Even Rafinesque did not assail the blackberries except to give names to two of Robin's unidentifiable accounts (*angulatus*, *nitidus*), although he left us generic names that we now assemble in Rubus. Not one of the many other historic names of authors and collectors in the past century is known in the blackberry part of Rubus,—Nuttall, Amos Eaton, Tuckerman, Torrey, Darlington, Gray, Beck, Darby, Dewey, Sartwell, Engelmann, Chapman, Gattinger, Mohr, Alphonso Wood, Vasey, Thurber, Olney, Carey, Buckley, Watson.

Bailey had begun to collect Rubus as early as 1882 and to publish in 1890 and more conspicuously in 1898; these studies had particular connection with the identification of the pomological varieties then coming rapidly into notice and were the first contributions to this end. It was soon apparent, however, that these varieties could not be botanically determined on the basis of the accepted species and existing herbarium material, and he began extensive field collecting in separated parts of the country and withheld his pen for many years.

The turn of the century found Blanchard, a Vermont school teacher, in the field, to whom should be added Britton, Rydberg, Brainerd, as publishers of novelties or hybrids. Blanchard's important collections were made in New England, although he later made journeys in the South and as far westward as Minnesota but late in the season for Rubus to be in best condition. He stressed the importance of the "first year cane" in determination of Rubus; his collections included leaves of these canes and other pieces to some extent, but we now desire fuller material of these parts. His specimens were excellent. Blanchard published his first species, *R.*

vermontanus, in 1904, and for seven years continued to recognize novelties until more than forty species and varieties were newly described. Blanchard deposited specimens in the Gray Herbarium, at the New York Botanical Garden and at the National Herbarium in Washington. In his later years, 1918, I purchased his personal Rubus herbarium, a large and important lot; it is from this lot that his new species and varieties should be typified when possible (for note on the numbering and marking of the Blanchard specimens, see Gent. Herb. ii, 279, 1932).

Blanchard undertook Rubus as a collector's primary aim, and he is entitled to be called a batologist. For years his work was neglected or distrusted. Brief sketch of him, with portrait, may be found in Gentes Herbarum, i, 141, 142 (1923).

Ezra Brainerd of Vermont was an ardent student of Rubus of his region. He assumed the hybridity thesis of Bicknell and Rydberg. His Blackberries of New England, in connection with Peitersen, appeared in 1920. It is a stimulating approach to the genus, although it may not solve the particular problems under its consideration. Brainerd's portrait appears in Gentes Herbarum, i, page 208.

A remarkable collection, of complete and abundant specimens, was made over a series of years by Mr. E. S. Steele, then of the United States Department of Agriculture, in the District of Columbia and surrounding regions from coastal plain to the Allegheny plateau; it has been of great service in understanding the species of that important territory.

In the meantime, herbarium collections of Rubus have been accumulating in many places, with good attention to complete specimens. It has been of great help to me to be able to consult the extensive collections at the Gray Herbarium, made largely by M. L. Fernald or under his energetic leadership and particularly representing New England and eastern territory, the Botanical Department of Cornell University, the New York Botanical Garden, the National Herbarium in Washington; and many persons have cooperated in the making of specimens and in the loaning of material. Special collectors have supplied me with abundant material, notably K. P. Jansson of Groton, Connecticut, and Stanley Jay Smith, undergraduate and postgraduate student in Cornell University. Yet in spite of these and similar herbaria of American Rubus, the materials in collections are likely to be inadequate for accurate study of the genus as a whole. Vast regions are yet practically not collected for Rubus.

The hybridity solution

Early in the present century began the singular hybridity postulate in Rubus work, whereby hybrids were freely assumed from herbarium specimens so fragmentary that not even the species themselves can be determined; thereby was the fear of making new species escaped and the

difficulty of understanding the plants was assuaged. This program was not adopted in the published work of Blanchard, and Fernald early objected to it; in fact, Fernald returns to the challenge in his most recent discussion of Rubus, in Rhodora for August, 1940. Blanchard, who was an inveterate field man, asked what would be the result in Aster if we "pick out a half-dozen and then call all others hybrids of those" (Gent. Herb. ii, 273). Contemporary authors in America do not accept it as a method in taxonomy. Inability to determine a specimen does not indicate hybridity.

The hybridity program was developed to great nicety by Sudre in his Rubi Europæ, 1908-1913, after the days of Babbington, William Moyle Rogers, and most of the work of Focke, none of whom engaged particularly in that mode of explanation. Recent contribution in this field may be found in Bulletin de la Société des Amis des Sciences Naturelles de Rouen, 7th series, 64th and 65th years, 1930, on Ronces de l'Eure et de la Seine-Inférieure by l'Abbe Toussaint in collaboration with M. Gustafsson. Naturally I do not express an opinion on the Rubus problem in Europe.

It is to be noted that even after all these years of assumption of miscellaneous crossing in the American brambles we do not yet have a satisfactory demonstration of the problem in nature. Absolute prerequisite to such demonstration is ability to recognize the species. No longer do we assume that intermediateness is demonstration of hybridity. Nor is infertility a conclusive evidence. There are many reasons for infertility. Some of it may be clonal. A certain colony may be fruitless for years and in some propitious season may bear abundantly. Sometimes apple trees do not bear, in spite of the fact that only five pistils in each flower are exposed to accident.

It is not to be understood that I am opposed to recognition of hybrids in Rubus. My objection is to the unscientific assumption that if a specimen, be it ever so poor, cannot be referred to any species at that moment recognized it must perforce be a hybrid. One may find in the field what are apparently real hybrids, but they appear to be no more common or any more puzzling than in other large genera; and in such cases a scrap on an herbarium sheet would not be evidence.

The hybridity postulate cannot explain the American pomological blackberries.

The collector is not to assume that puzzling forms are hybrids, any more than in other extensive and variable genera; that is to say, the subject is still amenable to taxonomic study. Hybridity is not an assumption, but a subject capable of investigation, and it should be approached in a scientific spirit. Evidences of hybridity are mostly three: (1) presence of the two parents in the vicinity; (2) occurrence usually in small numbers, as if incidental or exceptional to the main population; (3) characters that appear to belong only to the parents in various degrees of combination.

Whether any or all the species in any region are progeny of hybrids in remote time is quite another problem and one not yet capable of decision; I do not know how any of the species originated, any more than in Euphorbia or Fragaria. This is a phylogenetic rather than a taxonomic question.

If we had a self-perpetuating population of extended range and supposed to be of hybrid origin, we would still be under obligation to give it a name; it is not the particular office of binomial nomenclature to record origins.

It is possible, however, that in some cases the postulator of hybridity in Rubus has in mind not so much the actual crossing of species as a desire to account for variation. Perhaps sometimes it is an escape from deficiencies in diagnoses of species.

When we have familiarized ourselves with the species of Rubus we may begin cytological, genetic, breeding studies of them. Good herbarium specimens should be made of the plants under test, otherwise there can be no confidence in the results. Stocks should be chosen with care as to their authenticity, regularity of behavior, adaptability to the soils and exposures of the test grounds. Cytologic studies should also be made on normal plants in the wild as far as possible.

The problem in Rubus is the study of variation. Any removal from nature sets up a series of changes to be carefully observed, in order that the departures may not be confused with effects of hybridity or of experimental treatments; plants of unmanipulated stocks should be maintained in the plantation as checks. Any manipulation for results in science must be long continued, checked and rechecked, and the program should be undertaken with seriousness and with study of all the problems likely to be involved. The investigator should be absolved of notions.

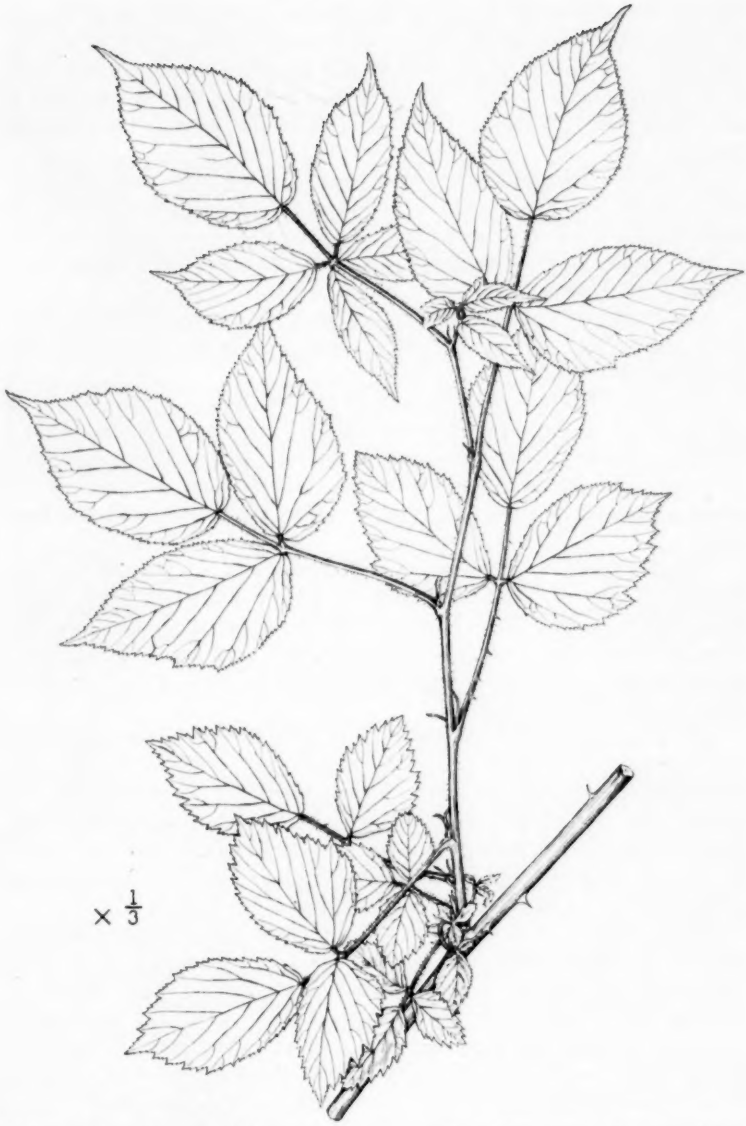
In the field

The bati or brambles comprise many other things than blackberries, as raspberries and many oriental species planted for ornament. Some of them native in this country are herbaceous, and others are not generally known by common names. The taxonomic difficulties, however, lie mostly with the Eubati or blackberries.

If the botanist is to make understandable collections of brambles he must come to the work with unbiased mind. He is likely to think the plants are too scratchy to collect with pleasure, and variations may appear to be so endless and specific lines so confused that the specimens may not be worth the trouble. All these notions are without foundation.

In my own experience I am never scratched in collecting Rubus. I wear heavy leather gauntlet workingman gloves and carry hand pruning shears. I am then able to invade the colonies and to make good specimens without hesitation.

It is not sufficient to collect only the weak or undeveloped growth about



2. PARCIFROND. Leafy shoot from a floricane, usually on lower part of axis and commonly sterile; not to be confounded with a primocane.

the approachable border of patches or colonies. These outside growths may look very different from the strong plants in the middle of the patch, and these big well developed growths should be collected. One could easily find "hybrids" and "formæ" by choosing the easily collected growths in negotiable places, in many of the big colonies, and never understand the species at all.

Only good honest full-size specimens are worth preserving. As many pieces should be taken in each collection as are necessary to represent the plant, always a full sheet specimen of the primocane and at least one other of the floricane *of the same plant*. The explanation of terms, pages 11-17, indicates what parts to take.

The Rubi are inhabitants of old fields, waste areas, roadsides, fencerows, open places. One wonders where they grew before the country was settled and cleared.

Even in a forested country, not all the territory is bowered in deep woods. There are open places where trees have not thrived, spaces along streams, denuded banks, mountains, swales, bogs, natural meadows. Elsewhere are vast areas of open treeless country. Some of the Rubi are found today even in deep forests, where other bushes may also find foothold.

When the country is cleared, the raspberries and blackberries find new territory. They are a vigorous inveterate lot. Sometimes they are weeds. How much they have varied because of this conquest cannot be stated, but there is no reason to suppose that new species have arisen thereby. One should be alert for escaped pomological varieties, that often persist for years among other plants.

The collector should undertake to procure flower-clusters and fruits that appear to be representative or average for the colony, at the same time that he may take to some extent unusual or aberrant parts. For example, the racemiform flower-cluster of *R. allegheniensis* is strikingly characteristic; yet on weak or crowded or undeveloped units in the colony the clusters may look like those of related kinds, but these few outlying clusters are not to be considered as invalidating the species.

Bramble fruits or syncarps are usually characteristic of the particular species, yet they and the individual drupelets are amenable to wide variation in size (and thereby often in shape) consequent on the conditions of soil, moisture, exposure under which the plants grow. The pomological varieties of blackberries and raspberries, as of strawberries and other fruits, are familiarly variable in differing soils and seasons and under the kind of attention they receive. The seeds in blackberries are singularly alike in related species even though varying with the size of the drupelets; I have not been able to make much use of them diagnostically, although hundreds of them have been examined and many drawings have been made. Seeds are

likely to vary in length to correspond to the length of the drupelet, even in the same fruit as to whether the position is at bottom, middle or apex of the berry. Markings and reticulations on the surface of ripe seeds, when cleaned of pulp, appear not to be specific in character as between related species.

Rubi in old run-out fields are likely to be remainders of colonies or invasions, now reduced to their lowest terms with many of the essential marks obliterated or obscured. On dry sterile lands the flower-clusters may be undeveloped. One should be on the lookout for depauperates. One may find similar problems along woods trails, where competition for light and room has been severe.

I have long been convinced that many of the variations in Rubus (and in other groups) are not explainable by any of the current assumptions, as I have stated on other occasions. In time we are likely to acquire a different approach to the subject, perhaps not yet foreseen, and to develop a vocabulary. Nor is it clear that we have yet found the methods for determining the origins of pomological varieties and mutations.

Terms

It is surprising that special terms have not been developed for use in phytography of the woody Rubi, as they have in many other groups, to define the organography and the polymorphism of the plant. Much of the disorder in the study of the genus is resolved if some of the parts of the plant are designated by appropriate technical names.

FLORICANE. Fig. 1. The flowering and fruiting growth from the ground up, the cane being then in its second year. (Latin *floricanus: flos*, flower; middle Latin *cana*, cane).—*Bailey, Gent. Herb.* ii, 279.

Blackberries and raspberries are perennial plants as to the underground parts and crown, but biennial as to the overground or vegetative part. The shoot rising from the ground is in its first year a *primocane;* in its second year it is a *floricane*, and after fruiting it dies: this is the biennial succession, one or more new primocanes arising while the others are bearing.

It has been the custom to collect only pieces of the floricane in flower or fruit to represent a blackberry or raspberry plant in the herbarium, but such material is not sufficient for satisfactory identification. In my own practice, the primocane material is habitually placed first in the cover, in order, and I go to it first to get my bearings.

PRIMOCANE. Fig. 1. Shoot from the base of plant in its first year, usually sterile. (Latin *primocanus: primus*, first; *cana*, cane).—*Bailey, Gent. Herb.* ii, 279.

In its second year, this shoot bears blossoms and fruits and is then a *floricane*, but the foliage, and sometimes the armature, are likely to be very different in the two seasons.

Formerly the primocane was called *sterile cane, new cane, first-year cane, turion.* One or more parts or sections should be taken of the primocane, in full leaf, for the herbarium; its tip should always be included. In making specimens, take care that the primocane comes from the *same crown* or root

3. NOVIRAME. A blossoming terminal or lateral of a primocane; infrequent occurrence, usually with an abormal type of inflorescence and therefore confusing to the student.

as the floricane. Two or three leaves from a primocane are not sufficient; the axis of the cane may be as important as the foliage.

PARCIFROND. Fig. 2. Long leafy shoot on a floricane below the ordinary short floral branches, mostly sterile but sometimes bearing flowers.—*Bailey, Gent. Herb.* iii, 121 (emend.).

The floricane produces flowering laterals, and also very short undeveloped branchlets of little significance in diagnosis. Aside from these laterals, well developed more or less prolonged leafy shoots may occur, from one foot to two or three feet long. As compared with the floricane itself, these leafy branches are short, whence the word *parcifrond* (Latin *parcifrons: parcus*, moderate or sparse, *frons*, a leafy branch). Foliage on the parcifrond may be quite unlike that of the short lateral floral shoots and of the primocane. Frequently the parcifronds are mistaken and collected for primocanes, particularly when they arise low down on the floricane; it is mostly to avoid this confusion that I have distinguished them by name.

NOVIRAME. Fig. 3. Flowering or fruiting axis or shoot on a primocane.

While the normal inflorescence in Rubus is on a floricane or second-year cane, yet sometimes a primocane blossoms and fruits. A fertile primocane or branch of it may be called a *novirame* or new branch (English *nova* and *rame;* Latin, *novus* and *ramus, noviramus*).

The novirame is an elongated shoot, either axial or axillary, with terminal and usually leafy inflorescence, produced for the most part later than the usual flowering, commonly quite unlike the normal fertile laterals on the floricanes of same plant. Such a shoot in the herbarium without explanation is likely to be confusing.

PHASIS. A pronounced difference from what is assumed to be the norm of a species, mostly lacking connected or significant range, that merits recognition but should not be defined in the taxonomic category of variety or form nor be accorded a Latin name; a guise.—*Bailey, Gent. Herb.* ii, 274.

A phasis (plural *phases*) is not a systematic subdivision, but is included within the definition of the species or variety. Sometimes a phasis is a single colony distinct enough to be recognized; at other times it is a geographical manifestation that cannot be defined under a Latin category because of the gradual modification from one region to another. If one had a specimen of a phasis and did not know the usual range of variation within the species, one might describe it as a new species or at least a new variety. It is to eliminate such inaccuracy that the author has proposed this other way of recognizing departures from what is conceived to be the taxonomic type, whether in habit, stature, season, or in more particular features. If all the recognizable variables in Rubus, particularly in Eubatus, were to be given regular varietal names, the literature would be heavily encumbered and no

gain in clarity would result. Sometimes the phases appear to be associated directly with soil, rainfall, exposure, elevation, competition, seasonal conditions, geographical region, and the like.

Examples of the application of the phasis-method were recorded in 1932 in treatment of *Rubus triviolis* and *R. flagellaris* (Gent. Herb. ii, 308-9, 322-3). Such manifestations are clearly not subspecies, nor are they botanical varieties or half-species. To record them without formal taxonomic designations tends to keep the treatment of Rubus simple enough to be understandable.

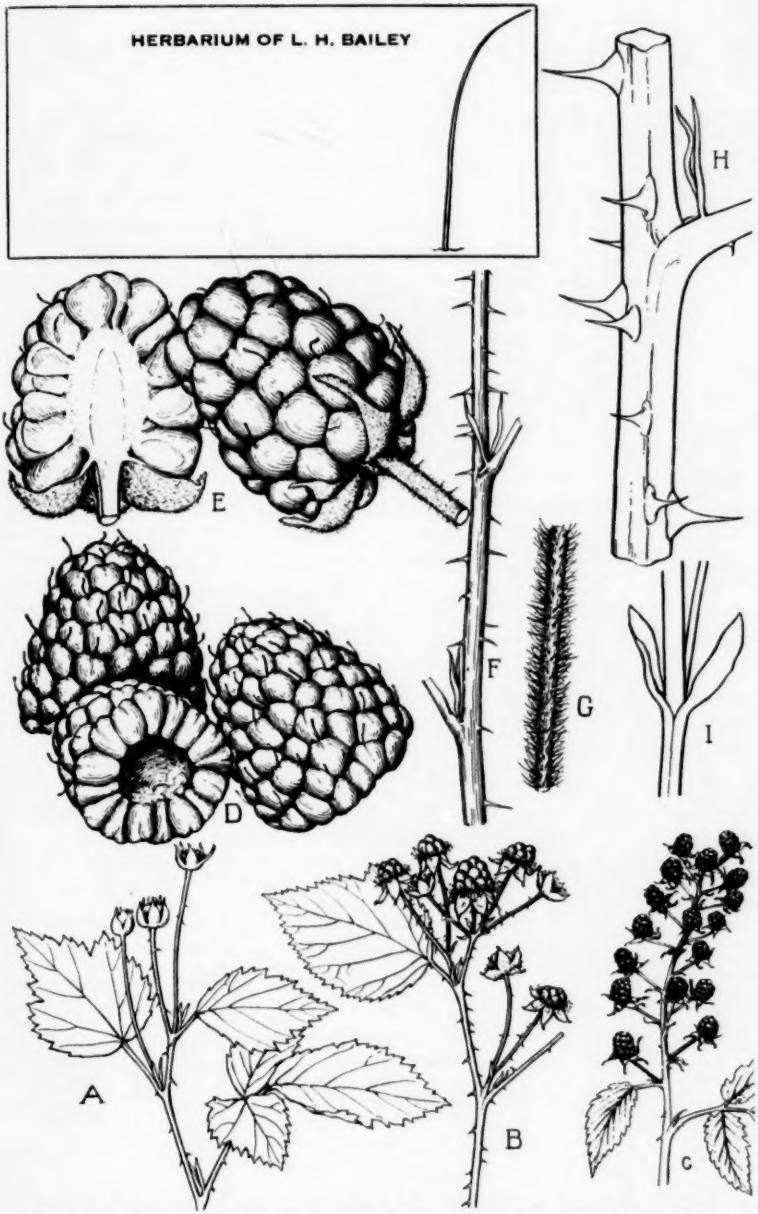
Recognition of phases is part of the diagnosis or description of the species or even of the variety. The author does not distribute his specimens in the herbarium in terms of phases, else he might disarrange the distributional or geographic sequence.

SEASONAL CHANGES. Disguises in the Rubi may be the result of marked differences in foliage and in tomentum at successive epochs in the season, a subject that has received practically no attention in the American blackberries. The case may be illustrated by *Rubus probabilis*, separated by Bailey in 1923.

The plant was taken by Blanchard in 1908 at Gate City, Alabama, now incorporated in Birmingham. Blanchard thought the plant to be *R. cuneifolius*, but the specimens were so unlike that species as known in the collections that Bailey gave it a name and asked that the plant "be looked for and good ranges of specimens obtained" as "material in herbaria is inadequate." No significant material has assembled itself in the intervening years except such as the writer has collected. It now turns out that the fruiting piece of Blanchard is an unusual novirame and the verdurous sterile shoot a late lateral branch of a primocane with leaves quite unlike those of the main cane itself. Twice the writer has searched in the suburb Gate City and found several plants that might be taken for *probabilis* (Gent. Herb. iii, 127, 128); one that was particularly observed yielded surprising results by bearing growths early and then late in the season that might easily be called two species, although critical examination discloses the kind of spring and midsummer character that one learns to expect in the southern spread of the *cuneifolius* group. Formerly it was the habit to pass such inconstants as hybrids, but this does not explain what is apparently a range of seasonal polymorphism.

Apparently there exists another species in the South and mid-South to which the name *probabilis* has been applied for some years, but that name must go with the Blanchard plant on which it was typified; this plant comes within the southern guise of *cuneifolius*, whether as a variety or other category will appear as this monograph proceeds.

If one assembles herbarium specimens of pomological native blackberries one must watch for seasonal differences, else the material may not



4. Details in Rubus. Bottom, forms of inflorescence: A, ascendate; B, cymiform; C, racemiform. Right, armature: F, aciculæ; G, setæ; H, prickles. Right, stipules: H, on petiole; I, on axis, as in subgenus Cylactis. Left, fruits, somewhat enlarged: D, Idæobatus (raspberry); E, Eubatus (Lucretia dewberry). Upper left, mark on label to indicate direction of canes.

be understandable. Here lies one reason for the uncertainty in referring the cultivated blackberries to their original species.

ARMATURE. Fig. 4. Most of the bati bear prickles of one kind or another, else they would not be brambles. Morphology of these organs, if it is significant, need not be discussed here, but only the terminology of description. The usual armature is composed of *prickles*, borne on the bark, which are stiff very sharp but short spine-like processes commonly not exceeding one-fourth inch in length, the base broad, as at H in Fig. 4. Sometimes they are multiple, with two or three points. Very small prickles are *pricklets*. Very slender prickles not broad-based are *needles* or *aciculæ* (singular *acicula*), as at F. More slender almost bristle-like processes are *setæ* (singular *seta*), and the part that bears them is said to be *setose*, G. Still more slender and almost hair-like growths make the part *hispid*, as in *Rubus hispidus*, or *hispidulous* when the processes are minute.

Of course there are many gradations between these categories, and in a single species, or even on a single plant, the armature may not be uniform. Sometimes a few canes in a well-armed colony may be almost devoid of prickles. Under cultivation "thornless" plants may arise; they may be propagated asexually and constitute a progeny called a variety in horticulture, with a vernacular name. If a specimen happens to be made from one of these aberrant canes and of none other in the colony, confusion is likely to result.

STATURE AND HABIT. The essential character of the plant as to habit of growth is quite as important to the determination of species as the armature, glands and other small items on which the herbarium worker must so largely depend.

Height may be stated on the label. The posture or direction of canes may be indicated on one end of the label by a line drawn when the collection is made, as in Fig. 4: see also Fig. 148, Gent. Herb. ii, page 291.

The following definitions of terms in Rubus are transferred partly from Gentes Herbarum, ii, 290, 291: A bramble is said to be *erect* when the general direction of the canes is perpendicular even though they may curve a little at the top. It is *ascending* when the general direction is upward but perhaps oblique or much curved. A cane is *arching* when it takes the general direction of a semicircle even though its tip or growing end may not reach the ground. It is *prostrate* when it lies prone on the ground. A prostrate cane may have *fallen* when carried to the ground by weight as of leaves, fruit, vines growing over it, or as the result of injury. Erect or ascending species may have fallen canes. A cane is *trailing* when it grows flat on the ground by habit, continuing its extension in this direction; the word is commonly erroneously employed for a cane that has merely fallen or is prostrate, and confusion results. A prostrate plant may not be a trailer. The true trailers among the blackberries usually strike root at nodes or

tip; they are represented particularly in the Persistentes, Hispidi, Procumbentes.

The plant may be *mounding* or *tholiform* (Latin *tholus*, dome, cupola). It is then of low or intermediate stature with overarching more or less horizontal canes that may reach the ground and take root at the tip. Usually such plants are intertangled by branching, making dense flat-topped clumps or mounds one to three feet deep. This habit is not characteristic of one set of bati and the term *tholiformes* is not accepted as a name of a primary taxonomic section in this paper. Mounders may be Persistentes, Procumbentes, Canadenses, Alleghenienses, Arguti.

Mode of inflorescence in Rubus (Fig. 4) is essentially cymose or determinate. The central or axial flower opens first (often represented by an abortive bud). Shape or looks of inflorescence, however, may be *racemiform* with an elongated form or axis and simple pedicels, *cymiform* with a cluster more or less as broad as long and perhaps with branched pedicels. The character of the cluster as to direction of pedicels may be *divaricate* when the parts are widely spread or stand approximately at right angles to the axis, or *ascendate* when they have a strong upward direction as in the case of certain few-flowered clusters; Fig. 4. *Rubus flagellaris* carries ascendate flower-clusters.

European blackberries, a few of which are naturalized in North America, are mostly *paniculiform* in inflorescence, a circumstance I mentioned in 1923 in description of the Himalaya-berry, and to which I particularly called attention in 1932 (Gent. Herb. ii, 294). "As a class, the European highbush Eubati are quite unlike the American, the flowers being in panicles terminating the canes and branches, and sometimes the canes may be more ligneous. Persons familiar with the Himalaya-berry will recognize this distinction." Exceptions in this conformation are found in certain of the Eurasian Eubati, particularly in *Rubus cæsius*, which is also established in North America. There are other exceptions in the European species, and other forms of inflorescence may be borne on the same plant that bears the paniculiform clusters. Many of the tropical American blackberries bear a paniculiform inflorescence but of another type, and may represent a range or morphology by themselves.

This monograph

Treatment of Rubus in this series of papers is monographic, not floristic. We are not yet ready for floristics in the genus, because collections have been mostly so few and so poor and scattered. Geographic ranges are stated as far as possible from examination of specimens, inasmuch as we cannot rely on records in books and lists.

When we begin definitely to cover a territory thoroughly in discriminating collecting, we shall be in position to make useful contributions in

journals and reports on special ranges and habitats and on plant associations.

With the statements in these preceding pages in mind, the consultant of these papers need not be confounded by the number of new species. These will be numerous in Eubatus. The reader must remember that Rubus in North America has never been studied with adequate material and field experience. Even though the number of species is great, it is still not our largest genus; and if keen students begin to study the genus many more novelties undoubtedly will appear. As in other large genera, many species will be found to be local.

The reader may suppose that I have split the species finely. The opposite is the truth. I could have described any number more if I had cared to pursue a separatist practice. I have taken the broad view. In time the lines undoubtedly will be drawn more narrowly. The first consideration is clarity on the general problem.

Prejudice against the making of new species has been strong in Rubus. Bicknell once wrote a challenging article on the subject, "Have we enough species of Rubi?", as if it were a question of volition. We have resented the making of new species in the very genus in which new species need most to be made.

The fear of making a new species in Rubus is well illustrated in a case with which I was long associated. The case is *Rubus Wheeleri* which the reader may expect to meet in a subsequent fascicle, where the history is recorded. At the time of its discovery no botanist would have thought of making a new species of Rubus. The spell was definitely broken when Blanchard began his excursions and publications over a period of nearly ten years, ending about 1913.

Those who are alarmed at the prospect of learning new species of blackberries may be reassured by the statement that most of them should have been described many years ago, and by this time we should have become accustomed to them. The extent of our ignorance of the genus in North America is indicated by the fact that most of the lists in local floras and elsewhere are not even approximately correct, and floristics cannot be based on them.

Opinion is abroad that the species in Rubus should be reduced to something like a half dozen. This means that the genus should not be studied or understood. Opposed to this is Fernald's recent statement, when contrasting his new *R. tholiformis* and *R. spiculosus* (Rhodora, xlii, 286): "these two superficially similar but really very distinct species well illustrate the localization of many species in the genus, many scores or hundreds of them yet to be worked out."

I have not felt safe in making subdivisions in Rubus below the rank of variety. I define a variety as a lesser category of a species: other defini-

tions do not hold water, being too philosophical or subjective. If one were to attempt to name *formæ* in Rubus the result might be appalling. One may note minor variations but there is no necessity to give them Latin names or to restrict them to formal categories.

One's judgment on species is naturally largely controlled by the specimens with which one works. In difficult genera these specimens should be preserved for the guidance of future workers, and not alone the type specimen of a new species. In this monograph all diagnoses are newly drawn or verified from living plants and herbarium specimens. It is of course not to be assumed that the author has arrived at finality in any species. The present monograph is considered by him to be only a framework for his successors.

For more than fifty years this work has proceeded. After the early efforts I was prevented for several years from publication by other duties and particularly by confusion in the attempt to make the Rubus flora fit the customary treatments: I was disinclined to make new species. It was about twenty years ago that I resolved to make a direct effort to understand the genus and to break with precedents. Within that time I have travelled many thousands of miles in the collecting of Rubus, in the United States and Canada. I have visited all the type localities of blackberries of my predecessors as far as such stations are definitely recorded. Result is that a large herbarium collection has been assembled, and that there are many specimens I do not yet name in these Fascicles. This monograph has been long in preparation and much of it was written some years ago and revised from time to time as new material accumulated, with modification of opinions previously expressed. It is not to be expected that I can long continue such revisions, and therefore publication is at last begun.

Inasmuch as I began my Rubus work in the attempt to refer pomological varieties to their species, I now continue that effort for such cultivated kinds as are represented in my herbarium. The only other sustained botanical attempt of this kind is by the late Alwin Berger at the State Experiment Station, Geneva, New York (1925).

The type specimens of species founded by me are in my herbarium (Bailey Hortorium, Cornell University), unless otherwise noted in the text.

The drawings in these Fascicles are by Florence Mekeel of the Hortorium staff.

RUBUS, Linn. Gen. Pl. Ed. 5, no. 557 (1754). Brambles.

Bossekia, Necker, Elem. Bot. ii, 91 (1790).
Cylactis, Raf. in Journ. de Phys. lxxxix, 97 (Aug. 1819); Amer. Journ. Sci. i, 377 (1819); *Cylastis,* Raf. Sylva Tellur. 160 (1838).
Dyctisperma, Raf. Sylva Tellur. 159 (1838).
Selnorition, Raf. l. c. 160.
Ametron, Raf. l. c. 160.
Manteia, Raf. l. c. 161.
Rubacer, Rydb. in Bull. Torr. Bot. Club, xxx, 274 (1903).
Oreobatus, Rydb. l. c.
Batidæa, Greene, Leaflets, i, 238 (1906).
Melanobatus, Greene, l. c. 243.
Parmena, Greene, l. c. 244.
Cardiobatus, Greene, l. c. 244.
Psychrobatia, Greene, l. c. 245.
Comarobatia, Greene, l. c. 245.

Rosaceous shrubs with pithy stems, or in a few species the herbage not ligneous, mostly bearing sharp bark prickles, stems creeping to erect, sometimes vine-like: leaves alternate and simple, ternate, quinate or fully pinnate or seldom decompound; stipules conspicuous, borne either on the axis or on base of petiole, broad or linear: flowers hermaphrodite (with very few exceptions) but sometimes functionally dicœcious, comprising a bractless calyx-cup with normally 5 persistent lobes, 5 separate white, pink or red deciduous petals borne on the calyx-rim, many erect stamens attached on the calyx-rim, carpels many on a flattish or conical torus, style terminal or essentially so: fruit a collection of fleshy or sometimes dry coherent but separate drupelets that may fall together as a cup (raspberries) or remain attached to torus (blackberries).

Seven hundred and more species in many parts of the world, most of them on dry land, but certain groups habituating in swamps, in the tropics usually in mountainous regions, particularly abundant in the northern hemisphere. Supposed to be the most variable genus in North America but this notion may be modified when the species are once understood. Many of the oriental species are attractive ornamental plants for foliage, habit and bloom; in North America prized mostly as small-fruits in the raspberries and blackberries, the latter representing a direct and relatively recent development from native species even before the species themselves were recognized. With the possible exception of the red raspberry and one or two others, the species in the Old and New Worlds are wholly distinct. A few European blackberries are naturalized, however, in North America. Type species, *Rubus cæsius,* Linn.

In 1874 in Germany, W. O. Focke, world student of Rubus, arranged

the western hemisphere Rubi into ten sections (Abhandlungen herausgegeben von Naturwissenschaftlichen Vereine zu Bremen, iv, 145). Sections in Rubus were increased to eleven by him in Engler & Prantl Die Natürlichen Pflanzenfamilien, iii, abt. 3, 28, in 1894. Three subgenera apply to native species in cultivation: Anoplobatus, Idæobatus, Eubatus. In 1903 Rydberg separated two genera from Rubus, Rubacer and Oreobatus, and continued the separation ten years later in North American Flora, xxii, part 5, 425. In 1906 E. L. Greene in his Leaflets, volume i, separated Batidæa, Melanobatus, Parmena, Cardiobatus, Psychrobatia, Comarobatia, Chamæmorus as genera, none of which has been accepted by later authors. Focke covered the subject again, 1910 *et seq.*, in his great Species Ruborum.

In the present monograph the genus Rubus is understood in its broad sense, to include all the brambles, but excluding Dalibarda because of its few pistils not placed on a developed torus and its cleistogamous flowers. The species within its territory arrange themselves in the following schema, involving six subgenera:

I. Plant herbaceous or essentially so, unarmed, dicœcious: leaves rounded, shallowly several-lobed: flower solitary on an erect short shoot bearing 1-3 leaves.....I. CHAMÆMORUS
Page 22

II. Plant unarmed, with wiry thinly woody or almost herbaceous stems, often prostrate or running, with no clear distinction of primocanes and floricanes (perhaps exception in No. 4): leaves lobed or ternate; stipules broad, attached on axis but sometimes also adnate at base to petiole: flowers solitary or very few.....II. CYLACTIS
Page 24

III. Plant armed with small short prickles, prostrate or running, canes woody: leaves rounded, often lobed; stipules broad and borne on petiole: flowers small, 1 or 2 from axils; petals very acute and little longer than calyx: fruit of few more or less separate drupelets.....III. CHAMÆBATUS
Page 43

IV. Plant strongly armed (with unarmed sports now and then), erect or trailing, woody, with marked primocane and floricane succession: leaves on primocanes ternate or quinate; stipules very narrow, usually subulate, borne on petiole: flowers mostly in clusters: drupelets fleshy and adhering to torus or core. *True blackberries*.....IV. EUBATUS
Page 45

V. Plant usually weakly armed, erect for the most part, with primocanes and floricanes: leaves ternate or pinnate; stipules narrow, borne on petiole: flowers in clusters: drupelets cohering in a fleshy cone that falls from the torus. *Raspberries*.....V. IDÆOBATUS

VI. Plant unarmed, erect, with peeling or flaky bark: leaves palmately lobed; stipules on petiole: flowers large and showy, usually rose-like, solitary or in short broad clusters: fruit mostly dry or hardly edible. *Flowering raspberries*.....VI. ANOPLOBATUS

These six subgenera may be keyed or briefly contrasted as follows:

Plant habitually unarmed.
Stems herbaceous and weak or essentially so, bark tight.
Leaves rounded but usually broader than long, only shallowly several-lobed: shoots erect.....1. *Chamæmorus*
Leaves 3-lobed or ternate: shoots sometimes prostrate or running.....2. *Cylactis*
Stems woody, stout, bark peeling or flaking.....6. *Anoplobatus*

Plant prominently armed (thornless mutations).
Corolla very small, little if at all exceeding calyx: flowers 1, 2 or 3, from axils: trailer.....3. *Chamæbatus*
Corolla prominent: flowers usually in definite clusters.
Berry (syncarp) with a core (torus).....4. *Eubatus*
Berry thimble-like, core or torus remaining on the plant.....5. *Idæobatus*

The botanical characters in Rubus are not alone in the small features, such as prickles on certain parts, glands, number of flowers in a cluster. The habit of the plant, and stature, are first considerations, as already stated, and these features may not be disclosed in the herbarium specimen but are evidenced in notes on the label or elsewhere. The primocane habit and foliage are particularly important, as indicated in the introductory pages. The structure or framework of the flower-cluster must be noted; Fig. 4. The armature is important although conclusions must not be drawn from a single specimen. Size and shape of fruit, and the drupelets, should not be overlooked, but due allowance must be made for effects of frost, drought, exposure, vigor of plant, factors that may also affect size of flowers. Within each particular subgenus the seeds appear not to afford dependable specific characters, but size may vary with size of fruit and drupelets.

I. Subgenus CHAMÆMORUS

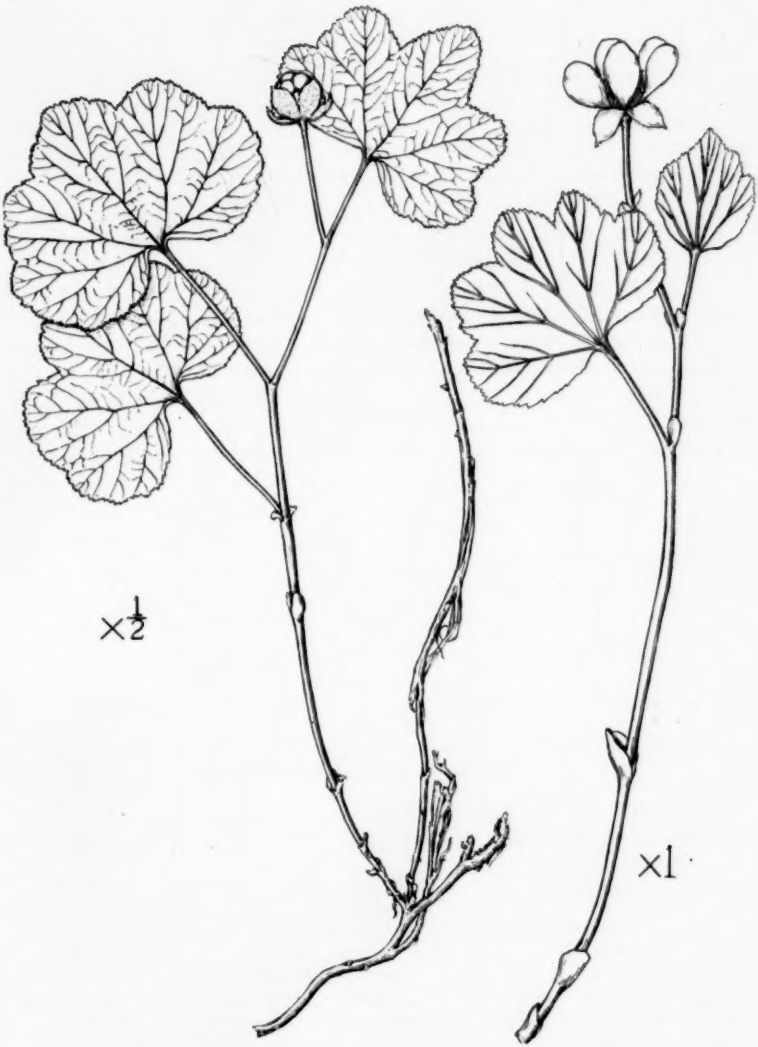
Focke, Spec. Rub. in Bibl. Bot., hft. 72, 12 (1910).
Section *Chamæmorus*, Focke, in Abhandl. Naturw. Ver. Bremen, iv, 142, 145 (1875).
Genus *Chamæmorus*, Ehrh. Beitr. iv, 147 (1789).

Plant simple, dicœcious, lobed leaves and a single flower borne on short seasonal shoot from a buried stock: unarmed: fruit large, blackberry-like. High northern, a single species.

1. **Rubus Chamæmorus,** Linn. Sp. Pl. 494 (1753). CLOUDBERRY. BAKEAPPLE. Fig. 5.
Chamæmorus Anglica and *C. Norwegica*, Greene, Leaflets, i, 245 (1906).

Little dicœcious bog or mountain plant with single-flowered short upright flowering stems a few inches high and currant-like simple leaves.

Low perennial producing herbaceous or slightly woody flowering shoots arising from semi-ligneous stems that lie just underneath the surface of the ground or are deeply buried in soft moss or mold, without prickles, glands sometimes present on upper stem and usually on the calyx but sessile or lacking prominent stalks: flowering shoots annual, erect, 6-12 cm. tall at anthesis, at first bearing only imperfectly developed or expanding leaves, the axis thinly pubescent and bearing conspicuous oblong or ovate to nearly



5. RUBUS CHAMÆMORUS, an herbaceous species of the North in both western and eastern hemispheres.

orbicular bracts 3-5 mm. long: mature leaves 2 or 3 to a stem, 6-12 cm. across, thickish, breadth commonly greater than length, orbicular-cordate to reniform, the basal sinus shallow or broad and deep, shallowly 5-lobed or sometimes obscurely 3-lobed, lobes blunt, margins doubly crenate or bluntly serrate, dark colored and glabrous above, lighter colored underneath and thinly pubescent on ribs or veins, petiole mostly lightly pubescent: pedicel 2-6 cm. long above leaf; flower 2-3 cm. across in expansion, white, petals conspicuous, contiguous, obtuse, somewhat exceeding the broad muticous glandular and pubescent calyx-lobes, filaments filiform: fruit to 2 cm. across, becoming yellow to orange, juicy, edible, calyx-lobes prominent, drupelets few and large; achenes large, shallowly if at all wrinkled.

Sphagnum bogs and mountain meadows in arctic and subarctic North America across the continent north of the international boundary to Greenland, extending southward to high mountains of Maine and New Hampshire as well as seacoast parts of Maine (as on Mount Desert), and a single station discovered in 1908 near Montauk Point on the eastern end of Long Island, New York (*W. C. Braislin*), but not since found there although diligent search has been made; the Long Island specimen, which I have seen, is in the herbarium of the Brooklyn Botanic Garden.

Northern Europe and Asia; type region in Sweden. This plant was known to herbalists as *ChamæRubus* (i.e. "ground Rubus") *foliis ribes*; also as *Morus norvegica*, also by Clusius in 1601 as *Chamæmorus Anglica* and *C. Norwegica*, and these pre-Linnæan binomials were brought up by E. L. Greene in 1906, but Ehrhart had also given the substantive generic rank in 1789. Chamæmorus is *ground* (or *dwarf*) *mulberry*.

II. Subgenus CYLACTIS

Focke, Spec. Rub. in Bibl. Bot., hft. 72, 23 (1910).

Section *Cylactis*, Focke, in Abhandl. Naturw. Ver. Bremen, iv, 142, 146 (1875).

Genus *Cylactis*, Raf. in Journ. de Phys. lxxxix, 97 (1819).

Plants low, often repent, unarmed or bearing a few weak bristles, without definite primocane and floricane succession, stems more or less herbaceous to thin and somewhat ligneous: leaves various: flowers hermaphrodite but sometimes functionally asexual, borne few to several on a branched or forked leafy weak stem: fruit blackberry-like. Mostly high northern.

There has been no uniformity of practice in the organization of these species of semi-herbaceous northern bati. Those included here are not homogeneous in character but it is hardly worth while to make several subgenera or other major classes to receive them. Focke makes a subgenus

Dalibarda to receive *R. pedatus*, *R. lasiococcus* and the plant American botanists prefer to separate as *Dalibarda repens*; the other species are retained by him in Cylactis, expanded from the original intention of Rafinesque.

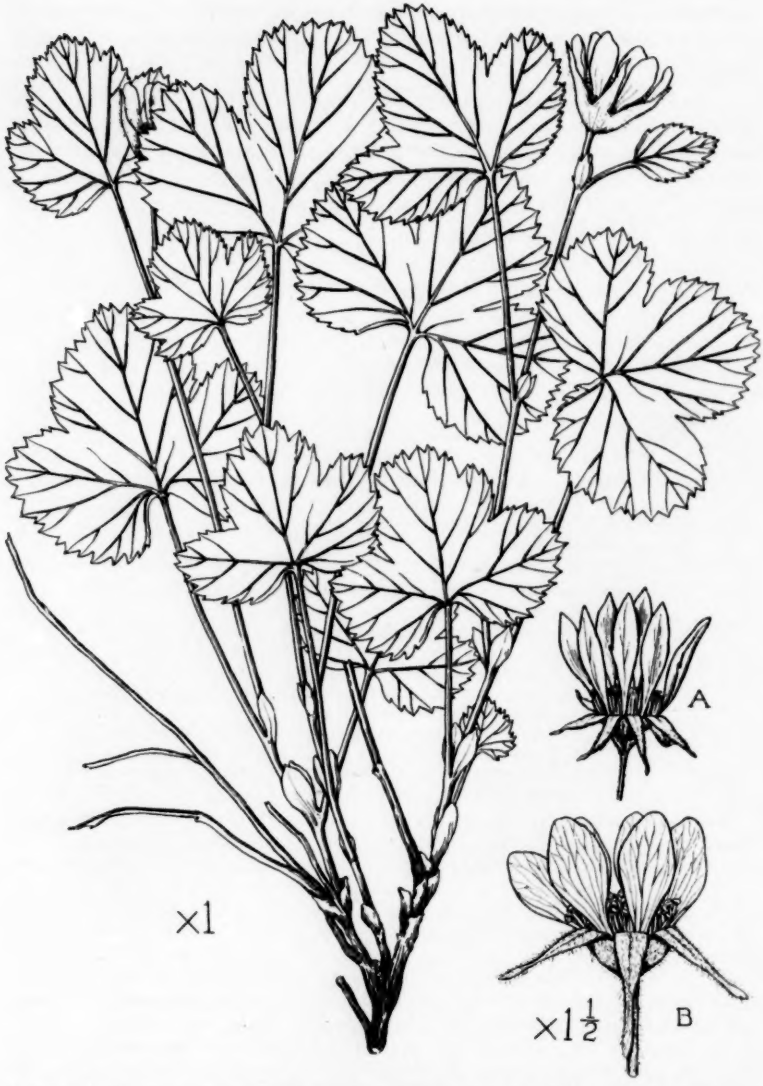
The present study, which has been long-continued, particularly of the *stellatus-acaulis* group, compels me to differ from my predecessors, even though many of the problems are not yet resolved. In this investigation I have studied the collections of the National Museum of Canada at Ottawa, National Herbarium at Washington, New York Botanical Garden including the specimens reviewed by Rydberg for his monograph in North American Flora, Gray Herbarium at Harvard University, and the Rubus sheets of J. P. Anderson, Juneau, Alaska.

A. Stems erect or tufted, not woody or permanent (unless in No. 4), plant not producing runners: leaflets or leaf-lobes usually blunt: flowers large, likely to be functionally asexual.
  B. Leaves 3-lobed, or sometimes rotundate in ambitus.....2. *R. stellatus*
  BB. Leaves 3-foliolate.
    C. Stems not glandular-hairy: leaflets small, usually 4 cm. or less long. .....3. *R. acaulis*
    CC. Stems bearing glandular hairs: leaflets large, terminal one 6 cm. or more long.....4. *R. alaskensis*
AA. Stems prostrate or running and rooting, often semi-ligneous: flowers bisexual, usually small.
  B. Leaves 3-foliolate, the leaflets acute.
    C. Flowers (or most of them) in a small condensed umbelliform cluster. .....5. *R. saxatilis*
    CC. Flowers borne singly, or if they are few then distinctly pedicelled and separate.
      D. Corolla rose-colored, often 2 cm. across at expansion, petals spreading at maturity: leaflets coarsely and commonly acutely toothed, not long-narrowed to base.....6. *R. paracaulis*
      DE. Corolla white (sometimes changing to pinkish), much smaller, petals erect: leaflets acutely toothed or serrate, terminal one long-narrowed to base (except in var.): plant long-running for the most part.....7. *R. pubescens*
  BB. Leaves pedate.....8. *R. pedatus*
  BBB. Leaves 3-lobed or unlobed, or if rarely 3-divided then the parts obtuse: carpels densely cottony.....9. *R. lasiococcus*

2. **Rubus stellatus,** Smith, Plant. Icon. Hact. Ined. t. 64 (1791).
NAGOONBERRY. KNESHENEKA. Fig. 6.
Manteia stellata, Raf. Sylva Tellur. 161 (1838).

Very small large-flowered herb with leaves broad and 3-lobed or even not lobed, usually distinctly hairy-pubescent: Alaska.

Herbaceous unarmed glandless perennial without rooting stolons or runners, with woody crown and usually a long tap-root, branching or forking only at base, vegetative parts 4-16 cm. tall and herbaceous, stems and petioles commonly with soft hairy spreading pubescence: stipules at base of plant broad but usually short-acute, narrower although conspicuous at upper nodes: leaves 2-5 to each stem or unit, long-stalked, pubescent at



6. RUBUS STELLATUS, native on or near the coastal parts of Alaska; a large specimen. A, flower from Kodiak island. B, RUBUS ACAULIS, from flower in author's garden.

least on veins underneath, main ones 2-6 cm. broad, length less than breadth, subcordate to open-cordate at base, sometimes unlobed or practically so but usually 3-lobed to different depths, apices prevailingly obtuse or nearly so, margins prominently but variously and obtusely double-serrate, veins conspicuous on either surface: flower usually solitary to each stem or unit, borne low down among the foliage or on tall stems from an upper axil, erect and pedicelled, rose-color; corolla ascending, to 2 cm. long, campanulate, petals narrow and long-clawed, sometimes notched on side; calyx more than one-half length of corolla, the very narrow pointed thinly pubescent lobes usually becoming reflexed: fruit nearly globular, few-seeded, pulpy and edible, 1 cm. and more diameter.

Coastal regions of Alaska, from Wrangel to the Aleutians and Pribilof Islands, in wet and alpine banks and meadows, lake shores and swampy places; common in many areas. Type region "in Americæ borealis tractu occidentali legit Archibaldus Menzies".

Rubus stellatus var. *acutistipulus*, Presl, in Epimeliæ Botanicæ 197 (1851), I do not place. It was founded on a sterile specimen collected at Nootka Sound, Vancouver Island, by Haenke. It had lanceolate or oblong acute stipules with one, two or three teeth. I do not know *R. stellatus* as far south as this; *R. acaulis* is in British Columbia.

3. **Rubus acaulis,** Michx. Fl. Bor.-Amer. i, 298 (1803). NAGOONBERRY. KNESHENEKA. Fig. 6B, 7AB.

R. pistillatus, Smith, Exot. Bot. ii, 53, t. 86 (1805).

R. arcticus, Auth. not Linn.

R. arcticus var. *grandiflorus*, Auth. not Ledeb.

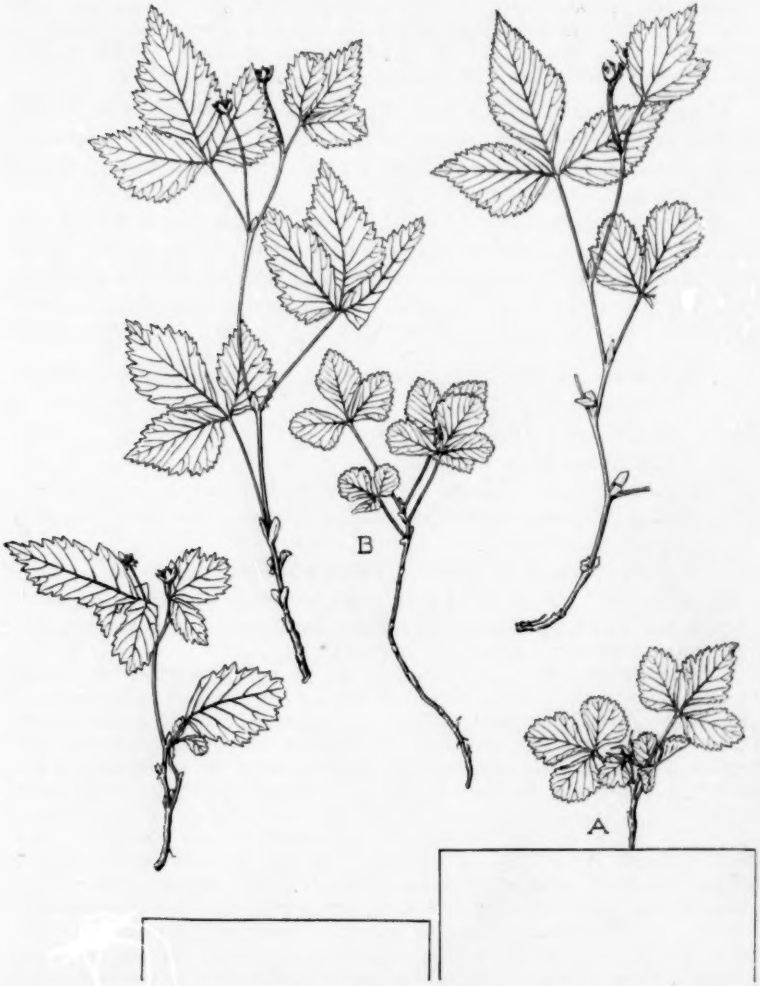
R. propinquus, Richardson, in Bot. Append. Franklin Journey, Ed. 2, 19 (1823).

Manteia acaulis, Raf. Sylva Tellur. 161 (1838).

Much like *R. stellatus* but leaves 3-foliolate and usually less rounded, running less to strongly hairy-pubescent forms, more likely to show extreme variations, range across the continent.

Low condensed plant, 5-8 cm. tall, in the forms to which the name *acaulis* is commonly applied but other forms to 20 cm. and open-growing: stipules broad and prominent on lower part of stem, becoming narrow and more acute on upper part, not alike on all plants: leaves various in size and shape and texture, 3-foliolate except perhaps some of the lowermost on the plant and which may be more or less undeveloped, petiolules very short; central leaflet usually 2-3 cm. long, oblong to nearly ovate to obovate, commonly with a narrowed or cuneate base, apex obtusely pointed to very blunt, margins irregularly and mostly obtusely dentate-serrate; lateral leaflets commonly smaller and more or less rhomboid; upper surface dull, under surface lighter colored and often almost glaucous: flower commonly solitary and often near surface of ground, sometimes 2 flowers on taller stems or units, variable in size, in shades of rose; corolla broad-campanulate, 1:5-2 cm. long, petals moderately broad to spatulate and clawed; calyx thinly pubescent, lobes one-half or more length of corolla and the very narrow lobes at length reflexed: fruit globular, 1 cm. or less across.

Widespread and variable species in meadows, woods, thickets, grassy bogs and tundra across the continent from Newfoundland and Labrador, and through Canada to Alaskan islands, southward to northern Minnesota and in mountains of Montana, Wyoming, Colorado; Kamtschatka. It makes an interesting garden plant at Ithaca, grown from Alaskan sources.



7. Rubus acaulis at A and B. Other three Rubus pubescens, originally described as *R. saxatilis* var. *canadensis*. Tracing of sheet in the Michaux herbarium in Paris. Reduced.

Type locality, region of Hudson Bay, in sphagnum; for discussion of the type specimen, see under *R. pubescens*. Richardson's specimen of *R. propinquus* is at Kew; it is a small single-flowered plant with three leaves, like the species I know and have defined as *R. acaulis*.

This is a difficult plant to understand if one endeavors to make two or three species of it, as is the custom. Perhaps it can be best defined by recognizing phases (page 13). Two may be mentioned:

Big-plant phasis, usually called *R. arcticus:* Plant 6-8, sometimes even 12-14 inches high, slender, open in growth, only thinly pubescent: flowers frequently two to a stem or unit, long-stalked: usually only the lower leaves rounded or very obtuse; terminal leaflets sometimes 4 cm. long or a little more.

Narrow-leaved phasis: Plant mostly small, 3-4 inches high: leaflets only about one-half as broad as long, often light gray underneath. One of these narrow-leaved forms I have described as new but withhold publication for further evidence.

I have not been able to recognize the Eurasian *R. arcticus*, Linn., in the western hemisphere. That is a plant of different habit or aspect, underground parts more slender, thinner foliage, coarser and sometimes obtuse simpler teeth or serratures, central leaflet longer than broad and not rounded and sides not straightly cuneate to base even if narrowed; differs from the occidental plant particularly in the short flower which is wide open or nearly rotate, petals not much elongated, blade broad and rounded, often 6 or 7 and sometimes denticulate on apex; calyx-lobes not so conspicuously long-pointed. These and other differences are evident in careful examinations of specimens and in authentic portraits like those in the 1792 Flora Lapponica, Flora Danica t. 488, Botanical Magazine t. 132, Sudre Rubi Europæ t. 213. Photograph of the Linnæan specimen is before me.

Forms of *R. acaulis* have been passed sometimes as *R. castoreus*. The *R. castoreus*, Laestd. of northern Europe, is a plant of different habit, bearing coarsely toothed to even jagged leaves on sterile parts, flowers often clustered, calyces with prolonged ends; Focke considers it to be *R. arcticus* × *R. saxatilis*.

Perplexities in the identification of this abundant transcontinental species are by no means disposed of in this paper, but the first approach to an understanding is an effort to represent all the forms in a given population rather than to collect only the pieces that happen to come to hand, and attention should be given to the proximity of *R. pubescens*. Some of the confusing material may be *R. paracaulis*. The very small plants with a single bright flower close to the ground look very separate and distinct; yet I have these condensed specimens and also open leafy plants several inches high and the flower on long slender pedicel collected at one gathering under the same number. We need critical collections in different patches or colonies across the continent.

† 4. **Rubus alaskensis,** spec. nov. Fig. 8.

Fruticulus erectus, fortis, inermis, pubescens, glandiferus, ad 35 cm. altus: folia 3-foliolata, firma; foliola lato-ovata vel rhombico-ovata, 6 vel 7 cm. longa, pæne 6 vel 7 cm. lata, brevi-acuta, serrato-dentata, supra glabra, infra pubescentia, petioluli brevissimi: flores 2 vel 3 summo axe, magni; corolla 2.5 cm. diam.; calyx 2 cm. latus vel plus ubi expansus, glandularis; calycis lobi angustissimi et ad finem reflexi.

Stout even though small erect plant with brown terete hairy-glandular canes, heavy large leaves of 3 leaflets, few very large flowers toward summit.

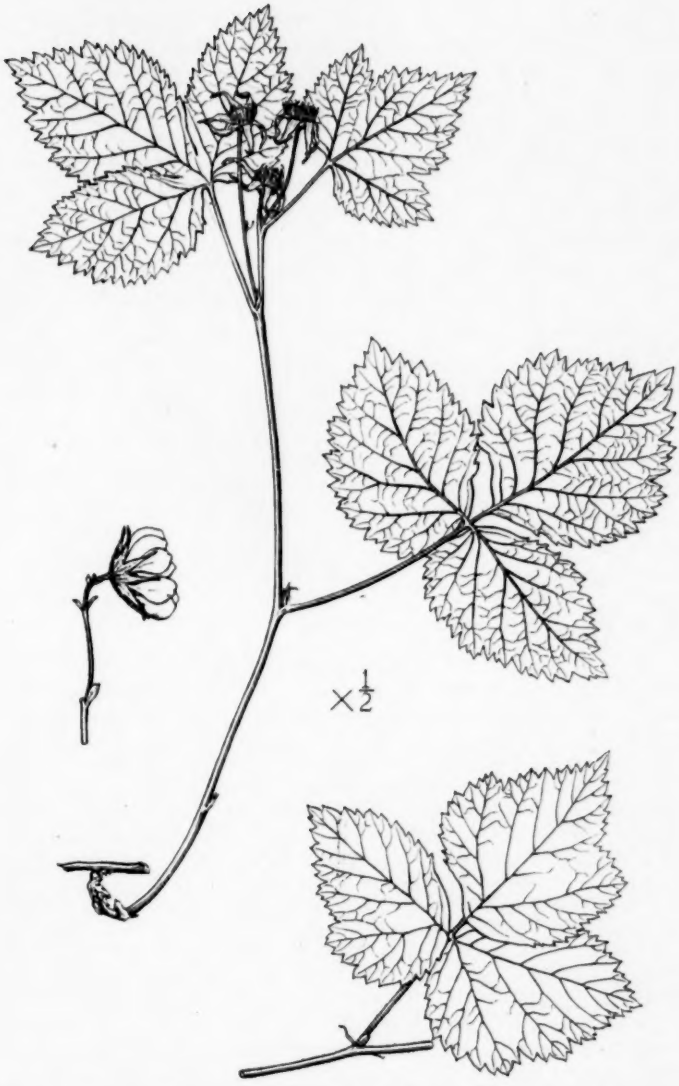
Erect, to 35 cm. tall, with more or less zigzagging leafy sterile canes, apparently with primocane and floricane succession; main axes terete, brown, more or less woody, without prickles, short-jointed, both sterile and flowering stems pubescent and bearing gland-tipped hairs: stipules lance-acute, pubescent and ciliate, upper ones very narrow: winter-buds to 5 or 6 mm. long: leaves large, thick, all 3-foliolate, dark colored and dull above, thinly pubescent underneath at least on veins, petioles pubescent and glandiferous, margins serrate-dentate with short-acute or obtuse teeth; terminal leaflet broad-ovate, 6 or 7 cm. long and 5-6 cm. broad, base short-tapering, apex abruptly acute; lateral leaflets unequal-sided or rhombic-ovate, 5-7 cm. long, practically sessile: flowers 1-3, in foliage at top of shoot, pedicels pubescent and gland-bearing; corolla as much as 2.5 cm. across, petals broad-spatulate and erose, somewhat exceeding the calyx, apparently rose-colored; calyx 3 cm. or more across when expanded, pubescent and glandular, the long narrow lobes reflexing.

Southern Alaska, *J. P. Anderson*: brush and grass land, Little Susitna canyon, *no. 1378* (type); wet soil, Matanuska, *955*; bogs, Mendenhall, *2A128*.

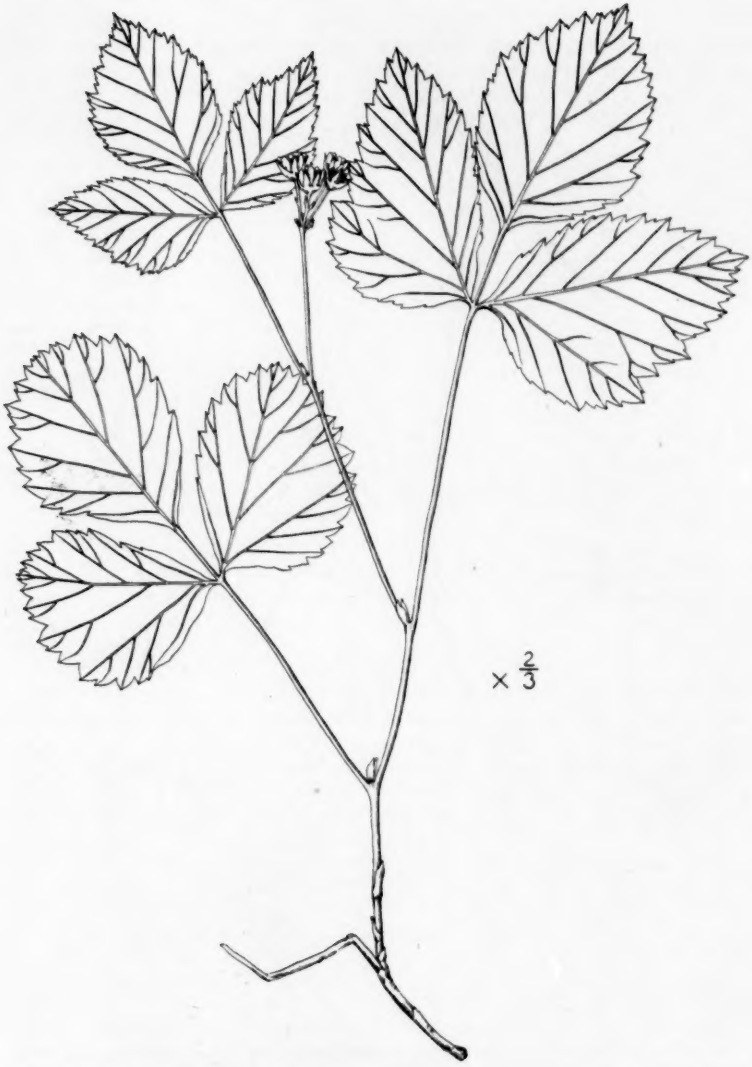
5. **Rubus saxatilis,** Linn. Sp. Pl. 494 (1753). Fig. 9.

Arctic, subarctic or high northern plant of soft growth, making herbaceous annual runners, flowers small in a close umbelliform cluster.

Herbaceous perennial, or stock somewhat woody at base, blooming on upright leafy shoots from the crown or from lower joints of last-year growths, some of the shoots as well as the crown giving rise to long slender prostrate rooting runners (that perish in winter), all the axes more or less hairy-pubescent and frequently bearing a few small weak spreading or declined prickles, not glandular: flowering shoots erect, 1-4 dm. high, carrying 2 or 3 leaves, one short side branch (as if a petiole) bearing a close cluster of 3-6 flowers well hidden beneath the foliage; these shoots dry-scaly-bracted at base and on the exposed leafy part bearing prominent narrow acute free stipules 7-10 mm. long: leaves ample, pale green; leaflets 3 and rarely the side ones deeply lobed, oval to broad-oval to ovate, acute, mostly with a tapering base, 5-8 cm. long and somewhat narrower, coarsely double-toothed, glabrous above, sparingly hirsute underneath, lateral ones short-stalked or sessile, terminal one with petiolule 2 cm. or less long, petiole 4-10 cm. long: flowers small, short-pedicelled to practically sessile, about 1 cm. across, the sharp-pointed thinly pubescent calyx-lobes about equalling the narrow separated greenish petals: fruit globular, 1-1.5 cm. across, red, composed of few large pulpy drupelets; achene large, about 4 mm. long, coarsely rugose.



8. RUBUS ALASKENSIS, large-flowered species newly described from southern Alaska. Lower leaf from primocane.



9. RUBUS SAXATILIS. Eurasian species known only in Greenland within our territory. An upright flowering shoot; small flowers in umbelliform cluster.

South Greenland, as recorded by Rydberg. The specimen is in the National Museum of Canada, from Tasserssuaq, collected by N. Hartz in 1889. I have examined this specimen and think it correctly determined. According to Tyge W. Böcher in Meddelelser om Groenland, Bd. 106, no. 2, page 137 (1938), there are only two known localities for *R. saxatilis* in Greenland. One is just mentioned, in birch scrub, and the other is in luxuriant talus slopes at Eqalingmiut in East Greenland (Devold & Scholander). Böcher records only one other Rubus in Greenland proper, *R. Chamæmorus*.

The species was described by Linnæus, "in Europæ collibus lapidosis", on stony hills of Europe. It ranges in cool and subalpine regions from the British Isles to Kashmir, Altai and far northward.

† 6. **Rubus paracaulis,** spec. nov. Fig. 10.

Differt a *R. pubescenti* floribus roseis magnisque in longis separatisque pedicellis, foliolis non longo-acuminatis, serraturis validis obtusisque; quam *R. acaulis* altior et stoloniferus, calycis lobis minoribus brevioribusque, foliolis fere majoribus et sparsius dentatis: erectus, 3-6 dm., flaccidus, pubescens: folia 3-foliolata; foliola ovata, oblonga, elliptica vel obovata: flores fere 2 vel 3 ad apicem, longo-pedicellati. 2 cm. diam.; petala angusta, patula; calycis lobi breves, reflexi: fructus globularis, nigrior, 10-13 mm. diam.

Soft herbaceous plant more or less trailing, with usually 2 or 3 conspicuous rose-colored or light pink flowers to a stem and coarsely obtusely serrate leaves.

Erect or nearly so, 3-6 dm. tall, but frequently producing slender runners that perhaps sometimes take root, the herbaceous stems that die back in winter loosely hairy-pubescent: stipules conspicuous, sometimes 10 mm. or more long but usually much smaller, oblong to lanceolate, lower ones nearly or quite obtuse, upper ones sharp-acute, sometimes dentate: leaves 3-foliolate, soft, dull and glabrous on upper surface, with scattered short hairs underneath, petiole slender and pubescent; terminal leaflet broadly ovate to elliptic to obovate in outline with tapering or cuneate base, short-acute at apex, distinctly petioled, 4-6 cm. long or exceeding that on sterile shoots; lateral leaflets not much smaller, unequal-sided, ovate to oblong, short-acute to obtuse, short-petioluled to subsessile: flowers conspicuous, rose-colored, to 2 cm. across at anthesis, borne mostly 2 or 3 (sometimes only 1) on slender pubescent not closely contiguous pedicels toward top of stem (often developing close from the original or primary flower), sometimes a trace of undeveloped glands under calyx; petals narrow, well separated, apex with short point, not produced into long claw; calyx small, lobes short, reflexing: fruit globular, 10-13 mm. diameter, black or blackish, of few loosely coherent drupelets.

Swamps and moist woodlands, Saskatchewan and Alberta, western Canada: vicinity of McKague in southern part of Judicial district Melfort, above latitude 52½°, Saskatchewan, *A. J. Breitung 566, 583* (type), *584, 788, 824, 831*; near Edmonton and Fort Saskatchewan, Alberta, above latitude 52°, *G. H. Turner 1698, 1781, 1913*. Apparently a consistent

species, yet it sometimes suggests a hybrid between *R. acaulis* and *R. pubescens*.

Flowers commonly not so large as in *R. acaulis* of its region, petals less elongate as also the calyx-lobes; leaflets more pointed; a larger diffuser bigger-leaved plant, often with short runners.

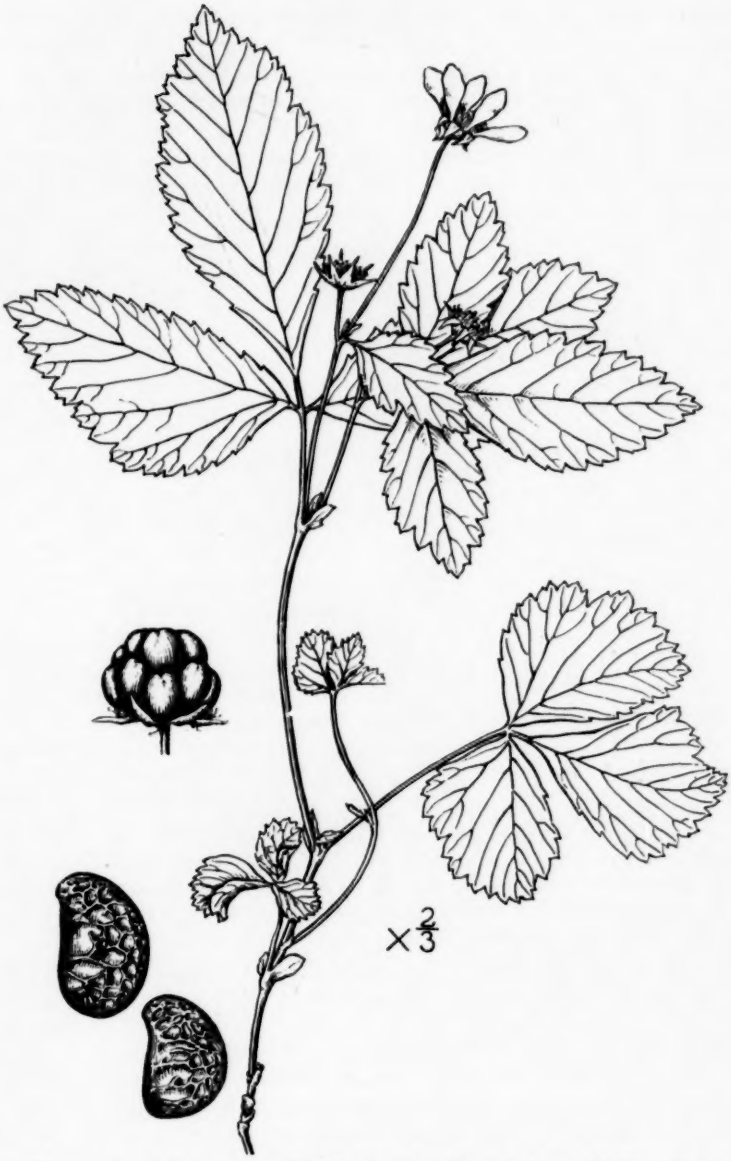
This plant, *R. paracaulis*, probably occurs elsewhere than in the western provinces, and it may clear up some of the difficulties in the understanding of *R. acaulis*.

7. **Rubus pubescens,** Raf. in Med. Rep. iii, 2 p. 333 (1811). Fig. 11.

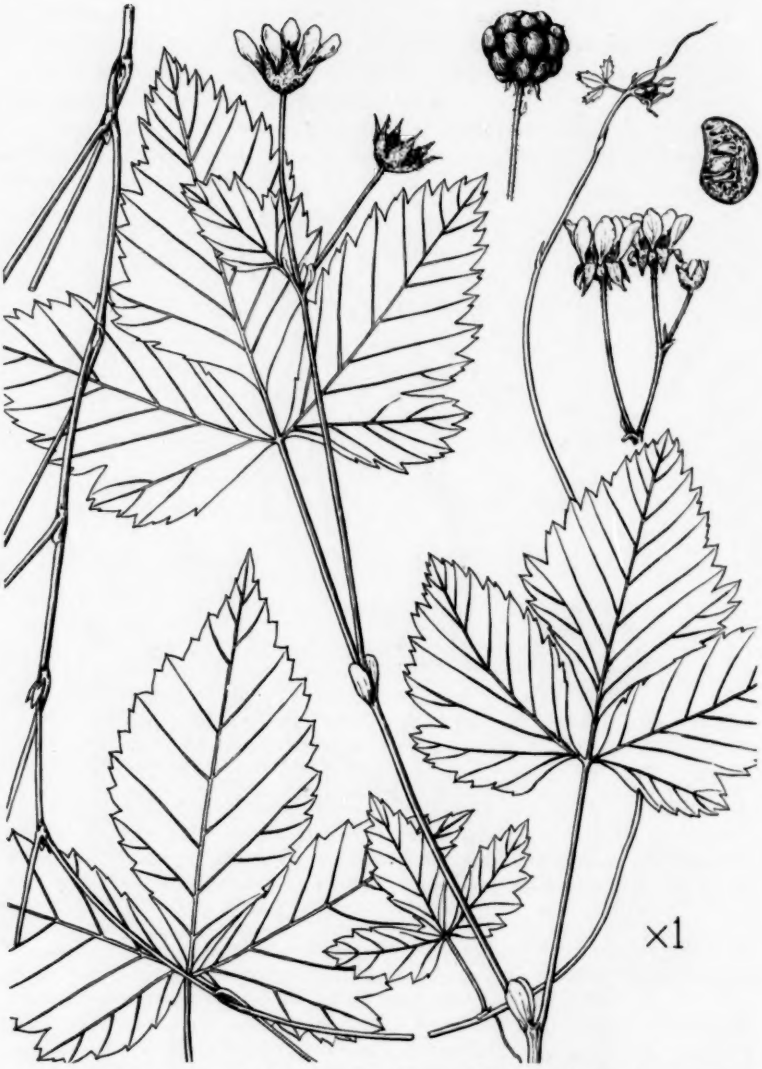
R. saxatilis var. *canadensis*, Michx. Fl. Bor.-Amer. i, 298 (1803).
R. saxatilis var. *americana*, Pers. Syn. Pl. ii, 52 (1807).
Cylactis lyncemontana, Raf. in Journ. de Phys. lxxxix, 97 (1819).
Cylactis montana, Raf. in Amer. Journ. Sci. i, 377 (1819).
R. triflorus, Richardson, in Bot. Append. Franklin Journey, Ed. 2, 19 (1823); Hook. Fl. Bor.-Amer. i, t. 62 (1840).
R. mucronatus, Seringe, in DC. Prodr. ii, 565 (1825).
R. ægopodioides, Seringe, l. c.
R. americanus, Britton, in Mem. Torr. Bot. Club, v, 185 (1894).
R. transmontanus, Focke, Spec. Rub. in Bibl. Bot., hft. 72, 27 (1910).
R. pubescens var. *pilosifolius*, A. F. Hill, in Rhodora, xvi, 152 (1914).

Extensively running practically herbaceous unarmed plant of bogs or cool lands with 1 or few inconspicuous flowers on short basal leafy shoots, the thin leaflets much longer than broad and acuminate, coarsely toothed or lacerate: fruit red.

Versatile profuse-running ground-cover plant like a strawberry making herbaceous flowering shoots from the crown or from the few lowest joints of last-year runners that may have been covered or protected over winter, and semi-ligneous wire-like tip-rooting canes of the season to 1 m. long, with long thread-like ends and more or less rooting at joints and from very slender axillary growths: stems nearly or quite glabrous, rarely showing a few weak prickles, bearing conspicuous free obovate mostly obtuse stipules to 10 mm. long and scaly-bracted at base: flowering stems arising from the crown and also from joints of last-year canes, 1-2 or 3 dm. long, erect, leafy, each bearing 1-4 flowers on slender peduncles and pedicels that sometimes carry a few glands: leaves very thin, glabrous or with sparse scattered hairs, 3-foliolate or sometimes 5-foliolate; leaflets oval to broad-oblong to nearly ovate but tapered at either end and the acuminate point conspicuous, 4-6 cm. long, often only half as broad as long, lateral ones practically sessile and the terminal short-petioluled, coarsely and sharply double-serrate: flowers small and not conspicuous, solitary on a shoot or sometimes a few approximately placed and forming an indefinite umbelloid cluster, greenish-white (sometimes showing pinkish outside), 6-10 mm. across, the veined narrow obovate-clawed petals well separated and not much surpassing the sharp-pointed calyx-lobes until the latter are reflexed: fruit



10. RUBUS PARACAULIS, now described from western Canada, but probably native also eastward. Fruit × 1½; seeds × 8.



11. RUBUS PUBESCENS, probably the most widespread North American species. Upper right, characteristic flowers when newly opened. Seed × 5.

bright or dark red, globular or conical, 5-12 mm. across, drupelets adhering to receptacle (blackberry); achene shallowly wrinkled or pitted.

In low and boggy land and swamps, or harder lands farther north, southward mostly in shady places, northern New Jersey to subarctic regions across the continent, in Newfoundland, Labrador and all the Canadian provinces, westward in United States to Indiana, Wisconsin, Iowa, Colorado and Washington, and to British Columbia; probably the most widely spread of North American Rubi. Variable in stature and leafage, given to aberrant forms; in the prairie provinces of Canada often with leaf margins more coarsely and less sharply toothed.

Type locality, Hudson Bay and elsewhere in Canada.

Separate flowering erect shoots without the runners are often difficult to distinguish from related species, yet the prominently acuminate sharply toothed relatively narrow leaflets are characteristic. The main synonymy is determined by photographs of the types of *R. triflorus*, *mucronatus*, *ægopodioides*, *transmontanus*.

This plant first appears in our literature in 1803 as *R. saxatilis* var. *canadensis*, Michx. Four years later Persoon entered it as *R. saxatilis* var. *americana* (so written). In 1894 Britton brought up the latter varietal name, as *americanus*, to specific rank, at a time when it was proposed to make such transfers of varietal names obligatory; the var. *canadensis* could not be elevated because of *R. canadensis*, Linn. The binomial *R. americanus* was used in Britton and Brown, Illustrated Flora, in 1897, and in Britton's Manual 1901. In the second (current) edition of Britton and Brown, 1913, the binomial *R. americanus* is abandoned and the plant becomes again *R. triflorus*, Richardson, as it had been from the time of Torrey and Gray, and is now in the current edition of Gray's Manual.

In 1909 W. H. Blanchard (in Rhodora, xi, 236) called attention to the fact that Rafinesque had published the name *R. pubescens* for the plant as early as 1811. This disposition of the case was adopted by Focke in 1910 and by Rydberg in North American Flora in 1913; *R. pubescens* is now the accepted name in local floras. The plant is only thinly pubescent, much less so than most species of Rubus, and it is unfortunate that the name *pubescens* must stand for it. Rafinesque had listed in the Medical Repository, iii, 1811, the species of American plants which, in his opinion, had been wrongly referred to European species, one of which is the Rubus in question. His binomial rests wholly on the cited synonym *R. saxatilis*, Michx.; he does not mention the subordinate name *canadensis* but inasmuch as Michaux had nothing else of *saxatilis* than this variety we are under obligation to adopt Rafinesque's account as effective publication. In his observation, Michaux speaks of the plant as "pubescens", and this undoubtedly suggested the name adopted by Rafinesque.

Revival of the Rafinesquean *R. pubescens*, 1811, requires the subjuga-

tion of *R. pubescens*, Weihe, 1824, a prominent bramble of Europe (cf. Gent. Herb. i, 197).

A few years later Rafinesque again gives attention to this plant, with no reference to his former publication. He makes a new genus of it, in an account of new genera of plants observed in 1817 and 1818 in the interior of the United States. In the French serial, Journal de Physique, de Chemie, d'Histoire naturelle et des arts for August, 1819, he founded the genus Cylactis (which we adopt in the present monograph as a subgenus) and made the single species *C. lyncemontana*, for a plant found in the summit of the Catskill mountains in eastern New York.

In the same year, 1819, he also establishes the genus Cylactis in the American Journal of Science (Silliman's Journal) and makes the single species *C. montana* for a plant "on the Catskill mountains near the great falls, etc." The descriptions in both cases undoubtedly refer to the same plant, which is his former *Rubus pubescens*.

Specimens of Michaux representing his *R. saxatilis* var. *canadensis* and *R. acaulis* occupy a sheet in Muséum National d'Histoire Naturelle in Paris. Fig. 7 is a tracing of this sheet. Two species and two labels are on the sheet, and five specimens. The small label carries the name *Rubus acaulis*, "in sphagnosis juxta sinum Hudsonis"; this phrase corresponds with Michaux's account of *R. acaulis*; and inasmuch as he speaks of all the leaves as subradical, leaflets sessile, and lateral ones subtrapezoid, flower one, I conclude that the name applies to the specimens I have marked A and B. It is apparently on these two specimens that we may typify *Rubus acaulis*.

Rubus saxatilis var. *canadensis*, which is now *R. pubescens*, is represented by the three remaining specimens in Fig. 7, leaflets acute, petioles unequal, flowers about three. The writing on the larger label says the plant is found in all of Canada. The label bears the name *Rubus saxatilis β americana*, but this may be a later addition.

† **R. pubescens** var. **scius,** var. nov. Fig. 12.

Compactus: folia 3-foliolata, foliola brevia lataque, non elongata, dense serrata, 4-5 cm. vel minus longa, pæne 4-5 cm. lata.

Compact plant, forming mats and not extensively stoloniferous: leaflets 3, short and broad as compared with *R. pubescens* itself and less tapering to base, not running into elongate forms, mostly closely serrate, 4 or 5 cm. or less long and nearly as broad.

Nova Scotia, Quebec, Newfoundland: on Cabot Trail beyond Cheticamp, Cape Breton Island, Nova Scotia, in great mats in open sun, *Bailey 568* (type), *580*, Look-off on Blomidon *Bailey 717*; Ile de la Chasse, Mingan Islands, north shore of Gulf of St. Lawrence, *Marie-Victorin* and *Rolland-Germain 18724*; glades in spruce thickets near the Rock Marsh, Flower

12. RUBUS PUBESCENS var. SCIUS. Condensed plant with short broad leaflets, native Nova Scotia northward.

Cove, Straits of Belle Isle, Newfoundland, *Fernald 28569*. The plant has been distributed as *R. arcticus*.

I have similar plants from Saskatchewan but leaflets are larger and more coarsely often obtusely serrate; probably of looser more open habit.

Separate pieces of *R. pubescens* may be determined erroneously as var. *scius*, but the variety is based on plants of compact appearance and of less long-running habit than the species itself as well as on the different foliage.

8. **Rubus pedatus,** Smith, Plant. Icon. Hact. Ined. t. 63 (1790). Fig. 13.

Dalibarda pedata, Stephan. in Mem. Soc. Nat. Moscow, i, 129 (1806).

Comaropsis pedata, DC. Prodr. ii, 555 (1825).

Ametron pedatum, Raf. Sylva Tellur. 161 (1838).

Psychrobatia pedata, Greene, Leaflets, i, 245 (1906).

Delicate, running flat on ground and mat-forming, a cinquefoil-like plant bearing 5-foliolate leaves and small white solitary flowers.

Stems semi-herbaceous, filiform or nearly so, running 1 m. more or less on the surface or in the mold and freely rooting at the nodes, giving rise to erect short flowering shoots, unarmed, glabrous or slightly hirsute, bearing hyaline brown stipular bracts: leaves small, thin, orbicular in outline, 3-5 cm. across, glabrous above and sparsely short-hairy on ribs underneath; leaflets 5 (or 3 and the lateral ones lobed nearly to base), pedately arranged, obovate-oblong, nearly sessile, obtuse, doubly dentate to incised, petioles 3-4 cm. long and very slender: flowers white, solitary from axils of the runners on filiform peduncles that are 3-5 cm. long, 2 cm. or less broad in expansion, the separated petals oblong and obtuse; calyx-lobes about equalling petals, toothed; filaments very slender: fruit red, glabrous, juicy, small, composed of 3-6 drupelets.

Moist and mossy woods, particularly in mountainous regions, Idaho, Alberta, Oregon, Washington, British Columbia, Alaska. Described originally from "western part of North America".

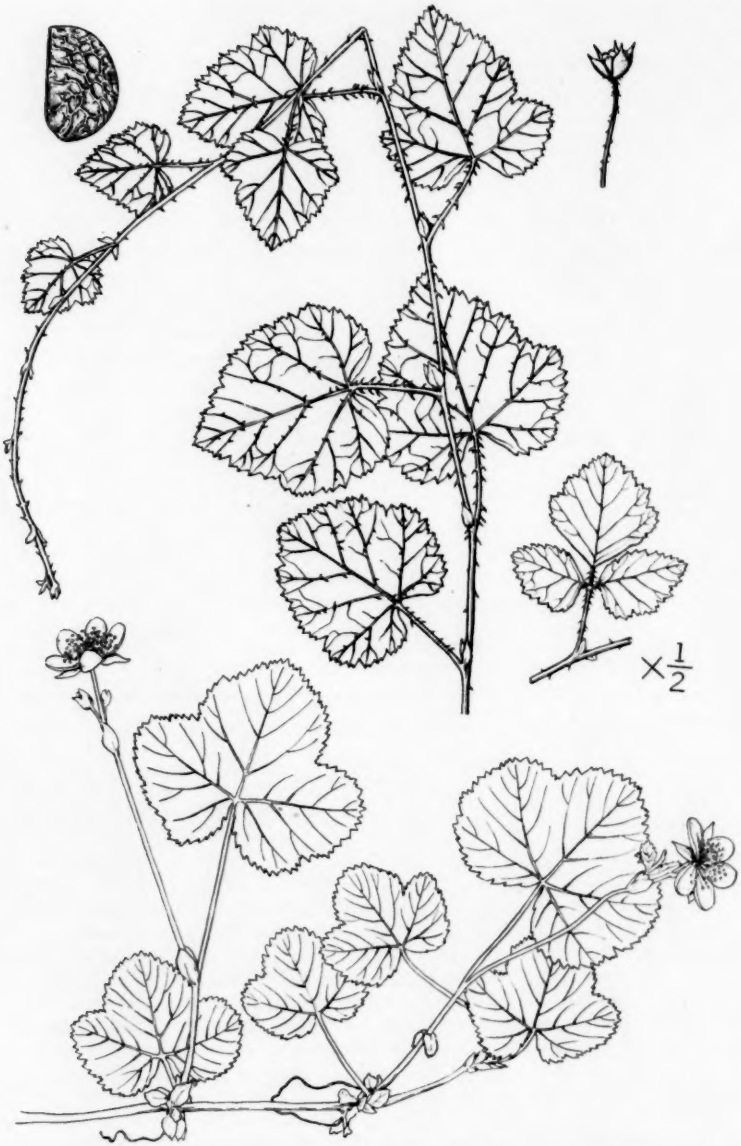
9. **Rubus lasiococcus,** Gray, in Proc. Amer. Acad. Arts & Sci. xvii, 201 (1882). Fig. 14.

Comarobatia lasiococca, Greene, Leaflets, i, 245 (1906).

Dalibarda-like little plant producing short runners and bearing shallowly 3-lobed rounded leaves, small white solitary or doublet flowers, and tomentose juicy fruits: flowering shoots very short, arising from the practically subterranean runners of the previous year.

Semi-herbaceous, making unarmed somewhat pubescent decumbent or creeping shoots to 30 cm. long that may root at some of the nodes, or sometimes standing only as an independent leafy little clump: stipular bracts hyaline, brown, 5-10 mm. long, conspicuous: leaves orbicular in outline, 4-6 cm. across, provided on either surface with only a few scattered short hairs, slender petioles thinly pubescent, obtusely 3-lobed but sometimes 3-foliolate, the margins sharply double-serrate: flowers white, 1 or 2 to each fertile shoot from the crown or runners, all hermaphrodite, the shoot 3-8 cm. long and very slender; corolla 8-15 mm. across at expansion,

13. RUBUS PEDATUS. Slender plant much like a creeping potentilla, in northwestern states, western Canada, Alaska.



14. RUBUS LASIOCOCCUS at bottom. RUBUS NIVALIS above, with achenes in the calyx; seed × 5. Both species are native in northwestern states and British Columbia.

petals separate and obtuse and eventually reflexed; calyx-lobes sharp, sometimes dentate, equalling or exceeding the corolla; filaments very slender; pistils several to many, the ovaries white-cottony and prominent in center of blossom: fruit red, of few juicy tomentose drupelets (whence the epithet *lasiococcus*).

Mountain woods, northern California to British Columbia. Type locality, near Mount Hood, Oregon.

This species has much the character of Dalibarda in habit and tomentose carpels but lacks the two kinds of flowers of that Viola-like plant and it has more than a definite number of pistils.

III. Subgenus CHAMÆBATUS

Focke, Spec. Rub. in Bibl. Bot., hft. 72, 17 (1910).

Section *Chamæbatus*, Focke, in Abhandl. Naturw. Ver. Bremen, iv, 142, 145 (1875).

Plant running by means of woody prickly canes: leaves rounded, prevailingly not lobed or only shallowly lobed: flowers 1 or 2, close in the axils, small, with acute white petals little exceeding calyx: drupelets few, lightly pubescent. Species few, one North American.

10. **Rubus nivalis,** Dougl. in Hook. Fl. Bor.-Amer. i, 181 (1832). Fig. 14.

R. pacificus, Macoun, in Ottawa Nat. xvi, 213 (1903).

Cardiobatus nivalis, Greene, Leaflets, i, 244 (1906).

Flat trailer bearing simple cordate leaves, more or less woody scratchy canes, short-stalked usually solitary small white flowers with sharp petals, and red juicy fruits.

Canes somewhat ligneous, flat on ground, to 1 m. long more or less, the axis angled or striate when dry, glabrous to thinly pubescent, bearing sharp-pointed dentate mostly broad stipules to 1 cm. long, provided with many small but very sharp retrorse prickles: leaves cordate-ovate, 4-6 cm. across, short-pointed to obtuse, undivided in outline or mostly shallowly 3-lobed, sometimes irregularly 3-foliolate, margins sharply dentate-serrate, glabrous and shiny on both surfaces and scattered hooks on ribs underneath, petiole finely pubescent and prickly: peduncles 2-4 cm. long, rising from axils on the canes, pubescent and prickly, bearing 1 or 2 white hermaphrodite flowers to 15 cm. across, the separate narrow petals tapering both ways; calyx-lobes nearly or quite equalling petals, acute, more or less toothed and hirsute: fruit infrequent, red, thinly pubescent, the few drupelets juicy; achene prominently wrinkled or foveolate.

In mountain and high woods, Idaho, Oregon, Washington, British Columbia.

The binomial *Rubus nivalis* requires discussion. It begins with Sir William J. Hooker in Flora Boreali-Americana, 1840, in a description taken from a manuscript of Douglas. Hooker had "seen no specimens" and was

not "quite sure of its place in the genus." Description calls for a plant not more than six inches high "on the high snowy ridges of the Rocky Mountains." The plant is frutescent, leaves cordate and 3-lobed, sharply dentate, nerves and petioles with recurved prickles, stipules ovate and acute, peduncles short and 2-flowered, calyx-lobes (laciniis) lanceolate and pilose, fruit red, seeds few, large and wrinkled. He queries whether the flowers may be red. These characters were copied by early American authors but the plant was not identified. In 1878 Sereno Watson in his Bibliographical Index to North American Botany entered it as "a doubtful species, perhaps a form of *R. strigosus*." This reference to *strigosus* was repeated in Index Kewensis, but it is an inadmissible relationship.

Thomas Howell applied the name *nivalis* in his Flora of Northwest America, dated August 10, 1903, to a trailing plant growing in forests, Washington to northern California and Idaho, and this disposition has been followed by subsequent authors, as Focke and Rydberg. Howell had not listed this plant in his Catalogue of the Flora of Oregon, Washington and Idaho, 1884. A challenge of the Howell treatment came from the Canadian botanist, J. M. Macoun, in an issue of the Ottawa Naturalist dated February, 1903, several months in advance of the Howell date. He says that "the description in Hooker's Flora cannot possibly apply to the species described in Howell's Flora, and the name *R. Pacificus* is proposed as a substitute." An earlier *R. pacificus* by Hance in 1874, for a Chinese species, prevents the use of Macoun's binomial. Macoun cited a plant collected by Mr. W. B. Anderson at Comox, Vancouver Island, 1899, as his *Pacificus*. This specimen is preserved in the National Herbarium of Canada and it is before me as I write. It is the same as *R. nivalis* of current authors. In the Gray Herbarium is a sheet of *nivalis* collected in the Coast mountains, Tillamook County, Oregon in 1882 by T. Howell and L. F. Henderson; the label bears the characteristic script of Sereno Watson, and he probably made the determination.

Inasmuch as there is no type specimen of Douglas' *R. nivalis* we must depend on his description for identification. His Rocky Mountains were not the eastern ranges known by that name today. Probably he found the plant in territory that is now Oregon. Although the *nivalis* of later authors is a vine trailing on the ground, yet an erect fruiting shoot (as I have in my herbarium) would provide the stature he mentions. The fact that he questions whether the flowers are red indicates that he did not see the corolla, as one usually does not because it is less prominent than the calyx. His notation of red fruits is accurate description of the Howell plant, as well as the few large seeds. We do not know any other Rubus to which the Douglas description applies. For these reasons I follow Howell and retain the title *Rubus nivalis*, Dougl. in this paper, pending any new discovery that may clarify the situation.

IV. Subgenus EUBATUS

Focke, Spec. Rub. in Bibl. Bot., hft. 83, i, 48 (1914).

Section *Eubatus*, Focke, in Abhandl. Naturw. Ver. Bremen, iv, 148 (1875).

Woody plants with biennial herbage, ternate or sometimes quinate leaves on primocanes, linear-acute stipules adnate to base of petiole, drupelets cohering and also adnate to the fleshy torus which forms part of the "berry" or syncarp.—The true brambles or blackberries and dewberries; species very many in North America.

RANGE I. EUBATI INPANICULIFORMI VEL CETERI. Main flower-clusters not of the paniculiform type, but ascendate, cymiform, racemiform.

A. Species of dewberries or running blackberries, in which the canes habitually trail or lie on the surface by growing from the end in that position and take root at tips of primocanes or branches, the flowering shoots arising more or less perpendicularly from these grounded parts: pedicels for the greater part of the ascendate type, the clusters therefore mostly not distinctly of the racemiform kind or at least only abbreviatedly so. Frequently the primocanes are at first erect; sometimes the plants make distinct mounds, but trailing canes issue from them.

B. Primocanes and usually also the floricanes pruinose (with a "bloom"): canes terete: extensive mounders in habit.

C. Armature of short stout broad-based prickles: flowers bisexual: fruit with few large drupelets. Naturalized.....1. CÆSII

CC. Armature of slender or not broad-based aciculæ usually interspersed with smaller units and often with hairs and glands: flowers mostly functionally unisexual: drupelets many and of medium or small size. Pacific region.....2. URSINI

BB. Primocanes not pruinose: armature various: flowers regularly bisexual. Native, eastern and central.

C. Plant bearing hispid hairs or bristles (or at least bristle-like prickles) on the canes and usually in inflorescence: leaves firm and often glossy. Mostly northern.....3. HISPIDI

CC. Plant prickly rather than exclusively hispid or setose, but bristles sometimes present with the stout more or less hooked prickles.

D. Dewberries of the evergreen kind, some or all the leaves more or less persistent: bristles frequently abundant, occurring with the prickles: primocane leaflets prevailingly of the narrow or long order (certain exceptions). Southern.....5. PERSISTENTES

DD. Dewberries deciduous, not bristly: primocane leaflets commonly broad and large. Northern and southern. (Certain forms in No. 3 may be sought here).....6. PROCUMBENTES

AA. Species of upright and highbush blackberries, not truly trailing although sometimes over-arching and tips perhaps reaching the ground but not rooting (one or two exceptional cases in the Arguti): flowering mode nearly always of the cymiform or racemiform kind: armature various.

B. Blackberries with hispid or setose canes or pedicels or both, the prickles none or if a few present then not prominently hooked or broad-based: plants mostly of low stature and diffuse, usually not yielding fruit attractive for eating: under surface of leaves glabrous and hard to the finger, not velvety, pubescent if at all only indifferently on the veins: leaves firm, more or less glossy above, with prominent side-veins and a somewhat plicate appearance: flower-clusters mostly short and open. Northern.....4. SETOSI

BB. Blackberries without hispid or setose canes and pedicels, mostly of taller and bigger stiffer growth, the prickles (if present) usually large and

strong: fruit mostly attractive, and represented in the pomological varieties.

c. Foliage mostly coriaceous, white-tomentose or gray underneath: leaflets small, in most species more or less cuneate: very thorny not specially tall plants of stiff erect branching habit....7. CUNEIFOLII

cc. Foliage not white-tomentose, nor conspicuously cinereous underneath (certain partial exceptions in the Arguti): leaflets at least of primocanes large and soft, in oblong and ovate forms: the tall highbush blackberries.

d. Leaves essentially smooth and often shining: parts not glandular: canes without prickles or with only few and weak straight ones: flower-clusters mostly racemiform: the "thornless blackberries." .....8. CADANENSES

dd. Leaves (and other parts) variously pubescent, not shining: prickles usually abundant, mostly hooked or bent or at least broad-based.

e. Inflorescence, petioles, new growths and sometimes the canes bearing prominent glandular hairs: characteristic well-developed clusters long-racemiform with continuing axis, pedicels (except the basal ones) strongly divaricate and usually short.....9. ALLEGHENIENSES

ee. Inflorescence and other parts not prominently glandular, if glands are exceptionally present then few and not very large: clusters various, but not long-racemiform as a rule. .....10. ARGUTI

RANGE II. EUBATI PANICULIFORMI. Main flower-clusters paniculiform, often terminal on the axis of the cane. Naturalized species of the Sections Discolores and Vulgares.

Section 1. CÆSII.

Focke, Syn. Rub. Germ. 406 (1877), as subsection.

Low mounding plants with pruinose fresh primocanes and fruits, short but stiff prickles: fruit of few very large drupelets. Very few species, one of which is naturalized in North America.

RUBUS CÆSIUS, Linn. Sp. Pl. 493 (1753). EUROPEAN and SIBERIAN DEWBERRY.

Much branched plant growing in colonies and making deep mounds, bearing pruinose fruits, stiffly but sparsely prickly: leaves holding late in autumn and becoming bronzy-green.

Usually glandless: primocanes ascending, terete, the axis light colored and pruinose, soon arching, branching, later bending over and tip-rooting; prickles 10 or fewer to 2 cm. of length, hooked, 2-3 mm. long, expanded at base: leaves on primocanes 3-foliolate; leaflets ovate or the lateral ones rhomb-ovate and terminal broad at base to subcordate and as much as 8-10 cm. long when well grown, glabrous above, variously soft-pubescent underneath, abruptly pointed at apex, margins doubly serrate, petiole prickly, stipules conspicuous and broad at middle; floricane leaflets similar but sometimes nearly or quite obtuse: inflorescence small and broad, composed of 3-6-flowered units and solitary axillary flowers below, the pedicels thinly pubescent and prickly; flowers about 2.5 cm. across and rather showy, petals broad and contiguous; calyx pubescent, the broad lobes abruptly slender-pointed: fruit dull purple-black, when well developed about 2 cm. long and about 14 mm. thick, drupelets very large; fruiting calyx-lobes erect.

Ithaca, New York, where it has been established for many years and is spreading over a small area, covering banks and rubbish piles, probably escaped from plants introduced on adjoining property (where it is now absent) as a ground-cover; a coarse plant. Big Rock, Jefferson County, Kentucky, where it is said to be a wild plant of many years standing. Native in Europe and Siberia. It was once introduced into the United States under the erroneous name *Rubus dumetorum*, as a valuable trailing plant for covering steep embankments and unsightly slopes. It is also grown as a berry plant in cold climates. It is a very variable species in Europe and is said to hybridize with other species, even with the *R. idæus* group. *Rubus dumetorum*, Weihe, is hairy and glandular on stems and inflorescence; not known as an escape in North America.

The Siberian dewberry, *Rubus cæsius*, was introduced into the United States in 1930 by N. E. Hansen who writes in Bulletin No. 309, March 1937, of the Experiment Station of the South Dakota State College of Agriculture, Brookings, that he saw it in 1908 while sailing up the Irtysh River in Tomsk province, Siberia; he "noted with interest the many pailfuls of native dewberries brought to the steamer landings by the peasants". In cultivation on the open prairies at Brookings the berries have "been too small to introduce as a market fruit". He thinks it worth attention for breeding purposes, as it is hardy and productive.

I have specimens of *R. cæsius* cultivated in the United States as *R. ursinus*.

Another of the Cæsii, *Rubus corylifolius*, Smith, has been taken as an escape from an old garden at New London, Connecticut, by Jansson, and it is cultivated. It is a stouter plant than *R. cæsius*, primocane leaves likely to be quinate, stipules not expanded at middle, inflorescence comprising more flowers and sometimes essentially paniculate, fruiting calyx-lobes reflexed. Native in Great Britain and forms of it on the continent.

Section 2. Ursini. Pacific berries.

Rydb. in N. Amer. Fl. xxii, 429, 433 (1913).

Vitifolii, Bailey, Gent. Herb. i, 153 (1923).

Decumbent or trailing tip-rooting plants, often making great mounds or heaps, leaves mostly semi-persistent: primocanes very long, slender or stout, commonly pruinose or glaucous (at least when in full growth), setose or prickle-bearing or both: leaves 3-foliolate or 5-foliolate on primocanes, 3-foliolate or trilobate on floricanes: flowers in small cymose clusters terminating leafy shoots, mostly unisexual or self-sterile, petals of the staminiferous flowers large or long and showy: fruit usually black but sometimes red (or even white), firm, of many compacted rather small glabrous or pilose drupelets. Pacific region.

Any treatment of the Ursini at present is provisionary. Complete specimens and field studies are required. The species themselves offer few

characters of constant distinctions at the same time that one recognizes marked lines of departure. The three species named by the early authors are often thrown together; this is the easiest procedure but it does not clarify. Any number of foliage varieties could be described.

The group Ursini is very distinct from the eastern sections, but in Europe the *R. cæsius* group has similar appearance and that species is also somewhat established in the eastern states.

In the study of the Ursini I have had access to important collections in California institutions and large eastern herbaria. Specimens of Ursini in my herbarium, at time of going to press, comprise 622 mounted sheets.

A. Species prevailingly glandless: primocanes and herbage devoid of pinhead or stalked glands, as well as the pedicels and calyx (or seldom the calyx and upper part of pedicel with a few weak and sparse glands that appear not to be characteristic or permanent).

B. Plant bright- or green-looking and usually thin-leaved, or at least not felted-tomentose unless on ends of growing primocanes: foliage lightly pubescent to even glabrous underneath: primocanes lacking hairs between the needles: middle leaves of flowering shoots prevailingly 3-lobed and often vitis-like; leaflets for the most part long-pointed and acutely or subacutely serrate to sharply dentate: pedicels often unequally elongated.

C. Serratures of leaflets narrow, conspicuously sharp and often acuminate: leaflets (or at least the terminals) of primocanes and often of floricanes acuminate and acute: foliage dull or heavy green, stiffish or of substantial substance.....11. *R. vitifolius*

CC. Serratures broad or rounded, blunt or at most only short-apiculate: leaflets of primocanes obtuse or only bluntly narrowed: foliage bright light green, thin in texture.....12. *R. Eastwoodianus*

BB. Plant with dull or gray-green and felted-tomentose foliage, and prevailingly small leaves (except in the var.) without gradually acuminate apices, the primocane leaflets mostly broader than long: main primocanes usually bristly-prickly because thickly beset with needles of different sizes and many hairs: middle leaves on flowering shoots usually 3-foliolate: pedicels commonly less than 5 cm. long. The tomentose character is most marked on young growths and under surface of new leaves, a condition that often persists late in the season and usually remains as a thick gray pubescence underneath at least until the fruiting season.

C. Leaflets of primocanes broad (usually at least as broad as long): pubescence on under surface commonly not felted: pedicels and calyces not glandular (except in rare or unusual cases)...13. *R. ursinus*

CC. Leaflets or lobes long and narrow (usually about twice longer than broad), tapering to apex or acuminate, felted-pubescent on under surface and therefore cinereous or mouse-colored: pedicels and calyces sometimes weakly glandular.....14. *R. sirbenus*

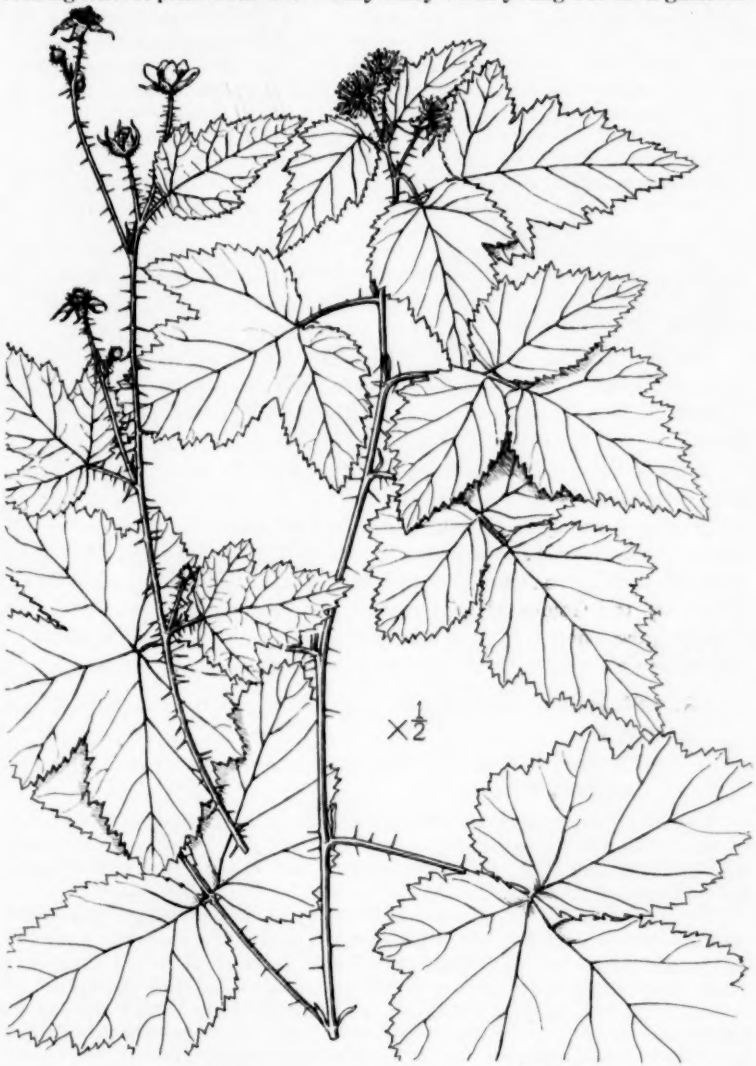
AA. Species conspicuously and often heavily provided on pedicels and calyx with long pinhead glands: primocane prickles stout, straight or somewhat hooked: foliage glabrescent or at least not densely pubescent (unless on young growing tips), that on primocanes commonly acutely toothed. No. 14 may be erroneously sought here.....15. *R. macropetalus*

11. **Rubus vitifolius,** Cham. & Schlecht. in Linnaea, ii, 10 (1827). Fig. 15.
R. ursinus var. *vitifolius*, Focke, Spec. Rub. in Bibl. Bot., hft. 83, 1, 79 (1914).

Green mounder and trailer or partial climber, not tomentose and nearly glabrous or only thinly hairy-pubescent, mound often to 1.5-2 m. high:

upper leaves on floral shoots 3-lobed or not lobed, pointed: inflorescence sometimes with few weak glands.

Long-running tip-rooted plant bearing many slender and nearly or quite straight bristle-prickles to 5 mm. long, foliage of stiffish smooth-looking leaves: primocane axes thinly hairy when young but soon glabrous



15. RUBUS VITIFOLIUS of western central California.

or nearly so, not pruinose, sometimes tomentose on tips: primocane leaves 3-foliolate or sometimes only trilobate or even not lobed, thinly hairy to nearly pubescent but becoming glabrous, petiole and main ribs underneath bearing thin prickles; leaflets ovate in outline, terminal ones to 9 or 10 cm. across either way and often subcordate, lateral ones much narrower and nearly or quite sessile, all pointed and margins sharp-serrate and variously notched or semi-lobulate (but sometimes departing to blunt apex and serratures), petiole shorter than lateral leaflets: flowering shoots usually longer than *R. ursinus* and sometimes branched, to 50 cm. long, very leafy; main leaves sharply acute, notched and sharply serrate, all but the lowermost 3-lobed or the upper ones without lobes, thinly pubescent underneath at first, most of them cordate or subcordate, 4-7 cm. long and sometimes much larger, more or less prickly on ribs underneath: flower-clusters at least sometimes large and open with branchlets or peduncles as much as 15 cm. long (sometimes longer) and prickly; flowers white, 1.5-2 cm. across, petal-blades oblong or oval and separate; sepals ovate-pointed or acuminate, pubescent outside and white-tomentose inside, cup prickly and sometimes with a few weak glands: fruit black, oblong to long-oblong, of many drupelets.

Western central California, from Mendocino to San Luis Obispo counties. A well marked species when positively recognized and apparently common within its range. I have taken it wild in Golden Gate Park, San Francisco, and elsewhere.

Type locality, San Francisco; original specimen not known to be extant, but recent collections appear to define it. Chamisso and Schlechtendal had only a flowering piece eight inches long on which to found the species. The original *R. ursinus* was collected at the same time, both at San Francisco, on the Kotzebue expedition; it is probable the landing was at Lobos Creek, by the Golden Gate, on what is now the Presidium, where *R. ursinus* grew when I covered the area a few years ago, and I found *R. vitifolius* in the vicinity. For narrative, see Gent. Herb. ii, pages 280, 281.

† **R. vitifolius** var. **titanus,** stat. nov. MAMMOTH BLACKBERRY. CORY. Fig. 16.

R. titanus, Bailey, Gent. Herb. i, 222, fig. 98 (1925), and var. *espinatus*, fig. 99.

Gigantic running or semi-scandent glandless blackberry, rooting at tips of canes that may be as much as 13 m. long, and that bears long-acuminate big leaflets longer than broad, not gray-tomentose except on tips of growing primocanes: fruit black, to 6 cm. long.

Plant with stout canes sometimes 10-13 m. long bearing very many straight broad-bottomed sharp prickles of varying lengths up to 5 mm. or more, the plant not glandular or strongly tomentose unless on young parts: primocane leaflets 3 or 5, ovate-acuminate and point prominent, to 10 cm. or more long, jagged-dentate, glabrous above or soon becoming so, pubescent but not gray-tomentose underneath, stout-prickly on petioles and ribs: flowers bisexual, 2.5 cm. or more across, in a leafy pubescent cluster 10 cm. or so long, the calyx-lobes broadly ovate and sharp or cuspi-

16. RUBUS VITIFOLIUS var. TITANUS. Mammoth blackberry; long an important pomological fruit.

date and much shorter than petals: fruit long-oblong, 4-6 cm. long, black, sweet and excellent in flavor, slightly pilose or glabrous.

Cultigen as known in California, grown on wires or trellises for the very large abundant fruit. Some of the stock grown as Mammoth blackberry is Loganberry and sometimes other things.

Mammoth blackberry originated with Judge J. H. Logan, in the garden that produced the Loganberry. He supposed it a hybrid between *Rubus ursinus* and Texas Early blackberry. (See Gent. Herb. i, 156, 1923). It was described and figured in Pacific Rural Press for September 4, 1897, "berries $2\frac{3}{8}$ inches in length being frequently found".

This marked variety has not been definitely recognized in the wild, although specimens I have from parts of California resemble it very strongly but they are not complete enough for positive determination. Type: specimens of Mammoth blackberry from *M. J. Moniz*, Sebastopol, California.

The var. *titanus* does not have the broad short-acute primocane leaflets of big forms of *R. ursinus* or of var. *loganobaccus*, nor the gray-tomentose covering except on terminal parts of growing primocanes and sometimes on the smaller leaves of floral branches. Yet it often bears the rounded kind of leaflets one expects in *R. ursinus*. The long-pointed primocane leaflets are more like those of *R. vitifolius*, but the leaves are usually pubescent underneath. If there is hybridity with *R. ursinus* or any of its varieties, the fact cannot be discerned in specimens.

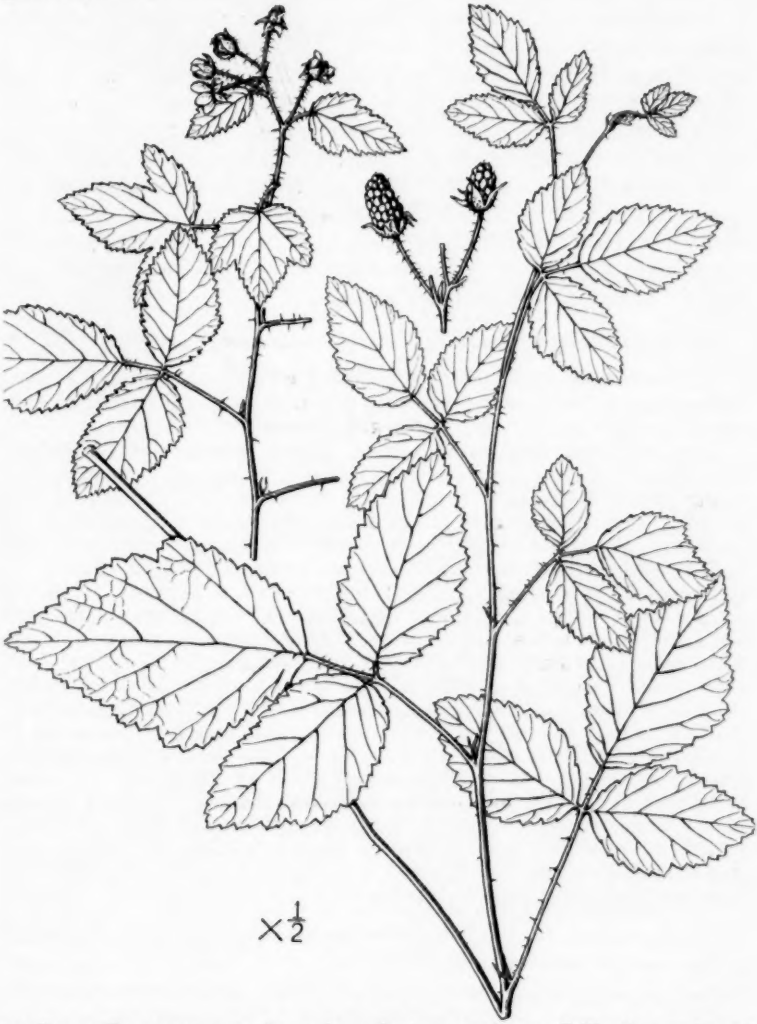
An unarmed race of var. *titanus*, with perfectly nude axes, pedicels and petioles, is known in cultivation as Mammoth Thornless and Cory Thornless blackberries. It is the berry named by me in 1925 *R. titanus* var. *espinatus*, but I prefer not to maintain that designation. The plant is naturalized in Burlingame, San Mateo County, California, *Howell 13891*.

12. **Rubus Eastwoodianus,** Rydb. in N. Amer. Fl. xxii, 460 (1913). Fig. 17.

Soft-leaved light green trailer and mounder, nearly glabrous, glandless or nearly so, bearing broad short more or less obtuse teeth or serratures on the leaves.

Trailer: canes at maturity glabrous or practically so unless on growing tips: primocane leaves long-petioled, 3-foliolate, green on both surfaces, upper face glabrous or bearing a few scattered short appressed hairs, under surface practically glabrous except for scant pubescence on veins and midrib with few scant pricklets, margins broadly and somewhat doubly dentate or serrate with the teeth nearly or quite obtuse in outline even though apiculate at apex; terminal primocane leaflets ovate or oblong-ovate, cuneate to broad or even subcordate at base, apex triangular and short rather than acuminate, outline sometimes rhombic; lateral primocane leaflets mostly oblong or elliptic and less prominently triangulate at apex; floricane leaflets usually 3 at base of floral shoots, oblong to short obovate and obtuse, but upper leaves on shoots 3-lobed or not lobed,

broad and mostly blunt in outline and sometimes subcordate: flowers 3-6 in a terminal indefinite prickly cyme, the pubescent pedicels and calyx sometimes carrying a few glanded hairs; petals of staminiferous flowers 12-15 mm. long and those of the functionally pistillates about one-half that length; calyx-lobes prominently pointed: fruit elongate, to 2 cm. long, glabrous.



17. Rubus Eastwoodianus, drawn from the type specimens. California; species yet in doubt.

California. Known positively only from the original collection, *Rydberg 6238*, from Mt. Tamalpais, Marin County, California, near San Francisco, represented by three sheets at the New York Botanical Gardens and from which this diagnosis is drawn although they lack mature main primocanes.

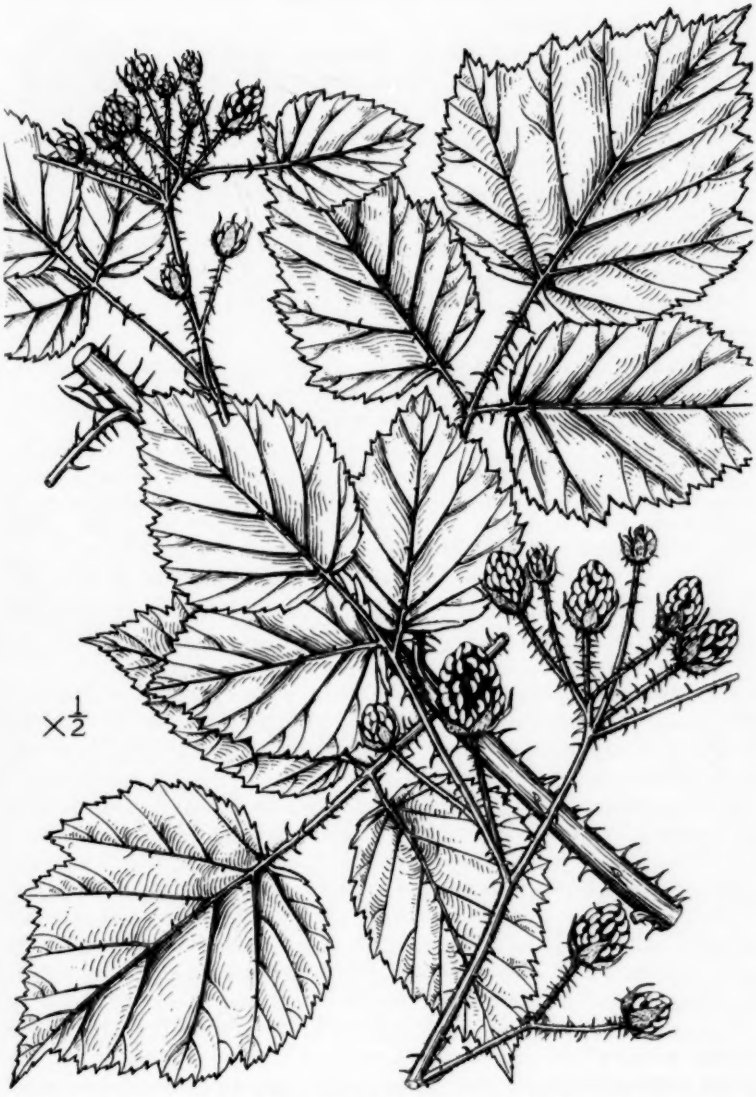
I cannot yet pass judgment on the validity of *R. Eastwoodianus*. It may be a shade form of *R. vitifolius*, although similar plants occur in widely separated regions on the western side of California. No. *13921 Eastwood & Howell*, from Bootjack, Mt. Tamalpais, is probably referable here because of its rounded indenture and general appearance although the specimens carry many simple broad cordate leaves, a form shown on the fruiting branch of the type specimens. A somewhat similar plant is *13799 John T. Howell* from Marin County, but with very broad cordate simple floricane leaves. Similar plants come from Inglenook swamp and Cleone, Mendocino County, *Eastwood & Howell 6166, 6191*. Perhaps a nearer approach to *Eastwoodianus* is *Robt. T. Clausen 4735* from Gragg's Canyon, San Luis Obispo County, but the fruits are globular.

13. **Rubus ursinus,** Cham. & Schlecht. in Linnaea, ii, 11 (1827). Fig. 18.

Loose-growing tomentose or at least grayish plant making great colonies and mounds with decumbent or running or semi-scandent canes, glandless unless infrequently and slightly on pedicels and calyx.

Primocanes pruinose (with a bloom), trailing to many feet, not glandular, pubescent to nearly glabrous, prickles usually straight or only curved, mostly weak bristle-like and crowded on primocanes and flowering shoots, many of them persisting on the floricanes: leaves on primocanes mostly 3-foliolate, sometimes 5-foliolate, on bristly glandless petioles; primocane leaflets ovate-pointed to triangular-ovate, terminal one stalked and 5-12 cm. long and very broad, more or less subcordate, dentate and shallowly margin-lobed or angled, smooth or becoming so above, the gray pubescence or tomentum underneath more or less vanishing or not always evident: floricanes still pruinose and prickly, sometimes lightly pubescent; floricane leaves various and variable, the lower and middle ones mostly 3-foliolate, uppermost ones 3-lobed, smaller and prevailingly less pointed than on primocanes or even almost obtuse, variously gray-pubescent or tomentose underneath: flowers 2-15 on or near the summit of lateral leafy shoots, on prickly pedicels that are glandless or practically so, white, hermaphrodite or variously imperfect, narrow petals to 15 mm. long and showy in the strongly staminate blossoms and smaller in the pistillate, tomentose calyx with pointed bristled lobes and only rarely with a few glands: fruit oblong or conical, sweet, 2 cm. or less long, black but produces white and red sports, more or less pilose.

Fields, valleys, low hills, neglected places, Oregon to Lower California in the western counties, western foothills of the Sierra Nevadas; widespread and abundant, in many guises or phases yet to be separated; the prevailing dewberry or running blackberry in California. Some of the marked departures may be worthy varietal names, but at present they



18. RUBUS URSINUS, the prevailing and abundant California blackberry, in many forms, extending northward to Oregon.

look to be too unstable and not correlated with ranges. Odd foliage forms may occur on novirames.

Type locality, San Francisco Bay; type specimen at Botanischer Garten, Berlin-Dahlem, a short floral piece with flowers yet in bud; Fig. 94, Gent. Herb. i, 218.

Known in cultivation in Santiam blackberry, a native wild selection; also in Nectar and Ideal. Some of the pomological varieties assigned to this species are *R. macropetalus*. The Aughinbaugh blackberry, formerly grown in California, is said to have been a form of the native species (and therefore presumably *R. ursinus*), but I have never seen the plant, and at that period botanical specimens of such cultivated plants were not made.

In cultivation in the United States it has been confused with *R. cæsius;* see page 47.

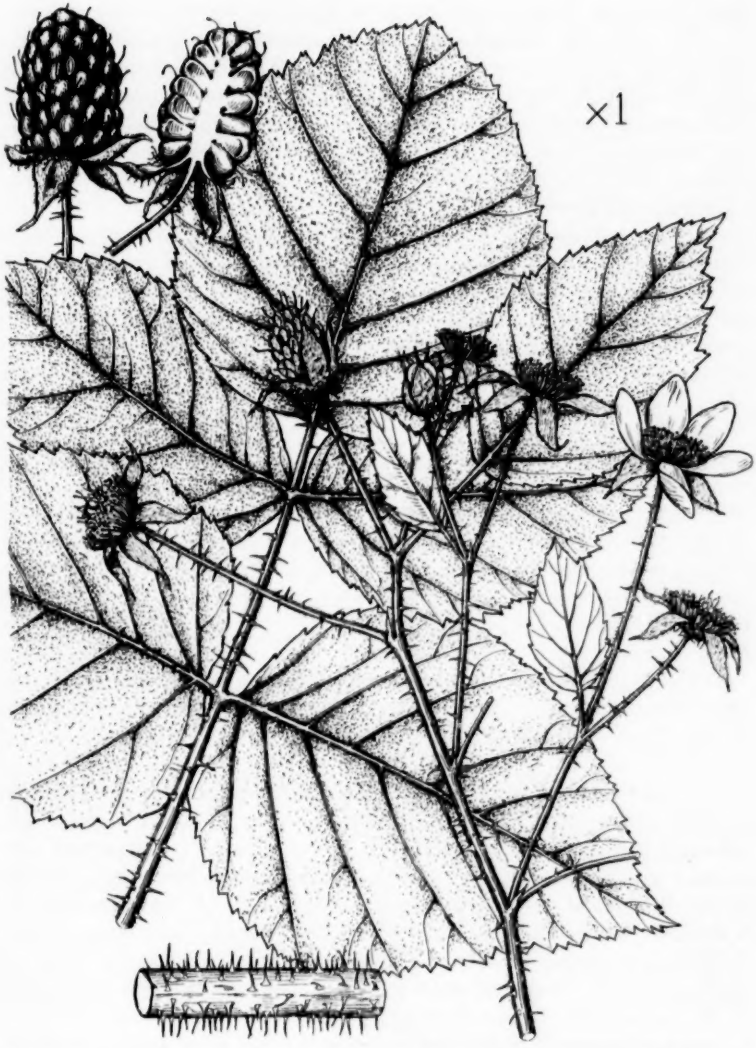
† **R. ursinus** var. **loganobaccus,** stat. nov. LOGANBERRY GROUP. PHENOMENAL. BOYSENBERRY. Fig. 19.

R. loganobaccus, Bailey, Gent. Herb. i, 155 (1923) with history.

Immense and strong grower, with stout straight prickles on primocanes, leaves large and thick, primocane leaflets gray-felted underneath, very broad and short-acute and often 5, the terminal one sometimes as much as 9 or 10 cm. either way or even to 14 cm.: flowers perfect: fruit long-conic, 1 inch or more long, dark red.

Cultigen. The cultivated stock came from the garden of Judge J. H. Logan, Santa Cruz, California, who died in 1928 at the age of eighty-six years. Type: specimens from *M. J. Moniz*, Sebastopol, California.

At my request, Judge Logan wrote me in 1892 a full and careful history of the origin of the Loganberry, with his opinions on its genesis. He thought it the result of a cross between red raspberry and *Rubus ursinus*, which, with other brambles, were growing in his garden; he does not mention, in this communication, that the Aughinbaugh was involved. This letter I yet possess. Extract from it was published in my paper on Certain Cultivated Rubi in 1923 (Gent. Herb. i, 155). I was then, as I said, strongly inclined to the opinion that Loganberry is a hybrid, as originally supposed. At that time I had not had opportunity to make careful comparisons with the wild *Rubus ursinus*. Two years later (Gent. Herb. i, 221) I had nearly given up the hybrid origin and said that its systematic status cannot be determined until the wild Rubi of California are understood. In 1932 (Gent. Herb. ii, 304) I had concluded that it has the general aspect of a robust or overgrown large-leaved *R. ursinus*. To this progressing opinion I now add my conviction that one may not need to go beyond *R. ursinus* for suggestion on the origin of the Logan blackberry. I do not know of any characters that cannot be observed in wild native plants if one is prepared to make the necessary comparisons. I am not aware of characters in the



19. RUBUS URSINUS var. LOGANOBACCUS. Loganberry, well known pomological variety, often bearing 5-foliolate leaves on primocanes.

Logan that could be supplied only by a red raspberry. This general attitude, I think, is now a frequent opinion among American students of these fruits.

The opinion of Judge Logan that his new berry was a hybrid with a red raspberry has had great effect on investigation. Had the suggestion not been made at the beginning it is doubtful whether the question would subsequently have arisen. It is significant that the Mammoth blackberry, also originated by Judge Logan, has not stimulated such a series of inquiries. The Phenomenal, which was also accounted to have raspberry parentage, is not different taxonomically from Loganberry.

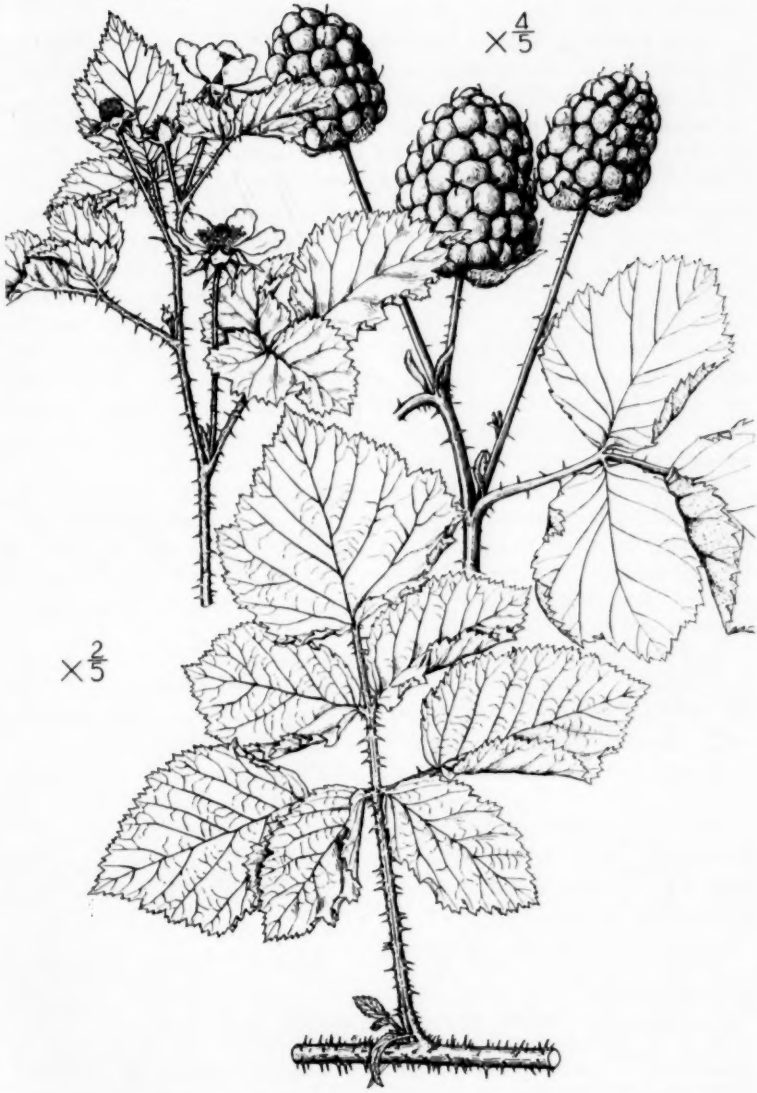
Several avenues of approach to these genetical problems are essential. The primary requirement is familiarity with variation of these California blackberries in nature. At the moment I have in my herbarium a dozen variations of *R. ursinus* picked up in the wild which have been given tentative names and are awaiting test as to their pomological value; botanically they are essentially like var. *loganobaccus*. It is not probable that we shall long retain the Latin trinomial for the Loganberry. Taxonomic morphology must be allowed its full weight in these studies. There is indication that chromosome behavior in native *ursinus* and *macropetalus* may be variable.

Cytological and similar studies on the origin of the Loganberry, as well as on genetics in Rubus, presenting another approach to the problem, have been made at the John Innes Horticultural Institution at Merton in England. Report on the Logan by M. B. Crane appears in the Journal of Genetics, volume 40, 129-140, and by P. T. Thomas on pages 141-156 (May 1940).

There is a "Thornless Logan", a race with unarmed plain axes, pedicels and petioles. From British Columbia I have a loganberry with full double flowers. A pomological variety, Black Logan, is now current.

The Boysen or Boysenberry, Fig. 20, now making much reputation and a little later than Logan in fruiting season, is of unknown parentage, although it has a definite history. I place it in var. *loganobaccus*. An account of it appeared in the Pacific Rural Press, January 15, 1938, by H. M. Butterfield, member of the Extension Staff of the University of California. Subsequently W. L. Howard, Professor of Pomology at Davis, California, interviewed Rudolph Boysen, now Superintendent of Parks in Anaheim, for whom the variety was named; the interview was committed to writing and Mr. Boysen approved it October 20, 1938.

Accounts agree that the history begins on the John Lubben farm in Alameda, California, where a good berry (called Lubben) of unknown origin was grown. Butterfield states that "it may have been one of Luther Burbank's seedlings, since Burbank pictured berry seedlings closely resembling the Lubben. But the exact origin will never be known". It is



20. RUBUS URSINUS var. LOGANOBACCUS. Boysenberry, now prominent in cultivation, particularly in California.

said that this Lubben berry was raised in that county for many years, under some other name.

John Lubben moved to Napa County and took some of the variety with him, and it was on the Napa farm that Boysen came in contact with it. Boysen himself states, in the interview, that on the John Lubben farm in Napa County, then occupied by a Mr. Harrington and where he was engaged, the Boysenberry originated as the result of pollinating a Himalaya-berry with some other kind of berry. "The hand-pollinated flowers were not emasculated before applying the pollen, but afterwards were covered with thin cloth to exclude insects. It is not known which flowers set fruit, but from those that did fruit the seeds were removed by Mr. Boysen and planted in flats. From the lot of seedlings, one was observed later, by Mr. Harrington, to be producing fruit of remarkable size. The new berry was propagated and Mr. Boysen took the original plant to his new home in Anaheim, California, where he multiplied it and sold some of the stock to the Coolidge Gardens of Altadena, Los Angeles County". Mr. Coolidge passed away before the formal introduction of the berry was arranged.

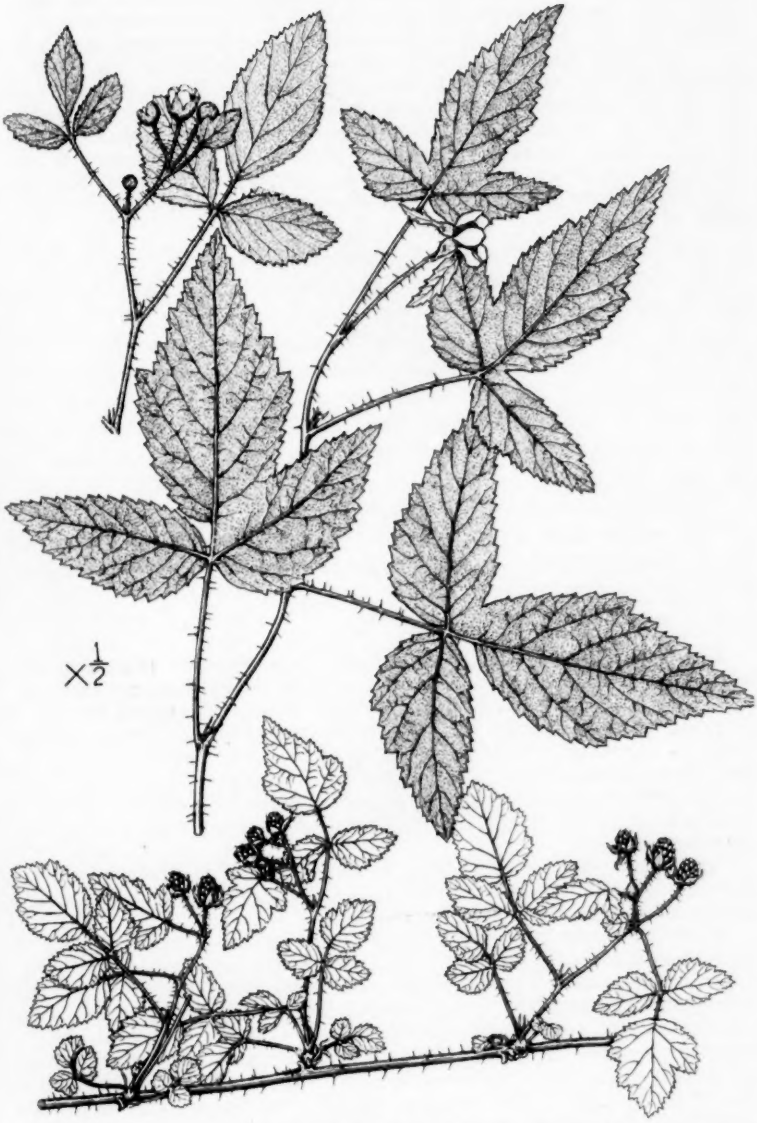
"However, in 1932, an agent of the Bureau of Plant Industry, Dr. George M. Darrow, called on Boysen to check up on the interesting berry previously described by Coolidge. This prompted Boysen to offer some of his cuttings from the original plant to Walter Knott, nursery propagator of Buena Park, Orange County, California, who, in 1934, offered it for sale as the Boysenberry."

In the revised edition of his Bush Berry Culture in California, Circular 80 of the California Agricultural Extension Service, May 1937, H. M. Butterfield discusses the horticultural merits of Boysen, Logan, Phenomenal, Young and Nectar blackberries, in a group by themselves.

I have seen no botanical evidence of Himalaya-berry in the Boysen.

The Young, or Youngberry, is one of the *ursinus* derivatives yet not to be included in the botanical var. *loganobaccus*. It is now an important fruit, result of a definite hand cross as the originator, B. M. Young of Louisiana, wrote me in 1931:

"While in California, the summer of 1895, I met Mr. Burbank. I had been one of his nursery customers and we had been in correspondence for some time before. At that time Loganberries were served as a novelty and I liked them and told Mr. Burbank that I thought of giving them a trial here. He urged me to get plants of one of the berries that he had sold to John Lewis Childs, that was later sent out under the name of Phenomenal. That winter Childs sold me one plant for $10 on condition that I would not sell plants. The plant multiplied very rapidly but none of the plants formed fruit-buds. Mr. Burbank advised me to check their growth and starve them to force the formation of fruit-buds. After several years with-



21. RUBUS SIRBENUS. Newly described California species, apparently widely spread.

out one fruit-bud having formed, I wrote him to send me a half dozen plants with the fruit-buds formed as I knew from experience with raspberries that I could get fruit by that method. The Phenomenal had in the meantime been disseminated by Childs so Mr. Burbank had six plants of Phenomenal, having fruit-buds, sent to me from California. Mr. Burbank advised my using Phenomenal as seed parent, which I did, emasculating the flowers in the bud state before any pollen had ripened. I selected Mayes for pollen parent because of the health of plant, flavor and aroma of fruit and large size of its drupes. About 300 seedlings were raised from this cross but the one called Youngberry was superior to any of the others in plant and fruit."

It is recorded by George M. Darrow, of the Bureau of Plant Industry, in an article in American Fruit Grower Magazine for January 1925, that Mr. Young had discarded the berry but had given plants of it to Mr. F. Jones who had a nursery at Jeanerette, Louisiana. Mr. Jones later moved to Lancaster, Pennsylvania, taking plants with him. Late in 1921 he sent plants to the United States Department of Agriculture. The plants came into fruit in 1924 at the Horticultural Field Station at Bell, Maryland, and its important qualities were recognized. Pictures were published in the magazine.

Thornless sports of Youngberry are known.

The plants show strong influence of Mayes parentage (one of the *R. flagellaris* associates) in inflorescence, shape and dentation of leaflets, and in pubescence.

† 14. **Rubus sirbenus,** spec. nov. Fig. 21.

Frutex repens, radicans ad nodos, caulibus teretibus, pruinosis, aculeatisque, axes secundarii pubescentes, primocani interdum 4-5 m. longi: folia primocanorum 3-foliolata, atria; foliola angusto-ovata vel lanceolata et prominenter angustata vel acuminata, duplo serrata, supra glabra, molliter cinereo-pubescentia subter, petiolus pubescens aculeatusque; foliolum terminale 5-7 cm. longum, 3-4 cm. latum: flores parvi, 3-4 brevicymosi; pedicelli aculeati et fere glanduliferi; calycis lobi angusto-acuminati et glandulares: fructus parvus, brevi-oblongus, 1 cm. longus; drupeolæ pubescentes.

Gray plant soft-pubescent on under surface of leaflets which are narrow and doubly serrate, canes pubescent and bearing straight weak prickles and no bristles, pedicels often thinly glandiferous.

Trailing, rooting at nodes: old cane terete, pruinose, retaining some of its pubescence and most of its slender prickles: primocanes ascending, thinly pruinose and minutely pubescent but lacking hairs or setæ, prickles very slender and scattered, straight and divaricate, 2-4 mm. long, secondary axes pubescent: leaflets of primocane leaves 3, dark colored, all felted-pubescent underneath to the finger, essentially glabrous above even if bearing a few short hairs, midrib underneath bearing a few spicules, margins doubly and acutely serrate, terminal one narrow-ovate to lance-ovate and prominently pointed, its blade 5-7 cm. long and one-half or more as broad, laterals smaller and less elongated, petiole pubescent and prickly: main floral shoots short, erect from the horizontal cane, 6-9 cm. high, axis hairy-

pubescent and bearing slender short prickles, leaves small, 3-foliolate or in the inflorescence simple, leaflets ovate or oblong and nearly or quite obtuse, soft-pubescent underneath: flowers small, 3 or 4 in a short cluster on prickly pedicels that may bear pinhead glands; calyx-lobes narrow-pointed and hairy-pubescent and either weakly gland-bearing or glandless, erect in fruit and in the pistilliferous flower little exceeded by the petals, calyx of

22. RUBUS MACROPETALUS. Abundant species Oregon to British Columbia, extending southward to northern California. Glandular in inflorescence.

staminiferous flower often foliaceous and dentate or lobed: novirames likely to be prominent, 30-45 cm. long and very leafy, bearing a terminal and upper-axillary flowers: fruit small, nearly globular or short-oblong and 1 cm. long, drupelets pubescent.

California. Amador County at Middle Fort, Jackson, very plentiful at 1300 feet, *no. 1 Guy V. Towsley* 19 sheets (type); Marin County in San Anselmo Canyon, *John T. Howell 13788*; Riverside County at San Juan River east of San Juan Hot Springs, Coldwater Canyon, Santa Ana Mountains, *Eastwood & Howell 3918, 3906* respectively; San Diego County at Dehr Creek in Pine Hills, and back of Sweetwater River near foot of San Miguel Mountain, *F. F. Gander A198, A221*.

15. **Rubus macropetalus,** Dougl. apud Hook. Fl. Bor.-Amer. i, 178, t. lix (1832). DOUGLAS BERRY. Fig. 22.

R. Helleri, Rydb. in N. Amer. Fl. xxii, 460 (1913).

Very long runner but with slender canes, grayish in aspect and pubescent but not tomentose, foliage not thick and heavy, persistent, leaflets ovate-pointed, pedicels and calyx prickly and conspicuously glandular.

Primocanes to 6 or 7 m. long, tip-rooting, pruinose at first, axis variously loose-hairy and bearing straight or hooked prickles 3-5 mm. long: leaves on primocanes 3-foliolate or 5-foliolate (except sometimes undivided near tip), sparsely hairy above and hairy or pubescent underneath, ribs underneath and petioles prickly, terminal leaflets usually stalked and sometimes 12 cm. long and one-third to one-half as broad, lateral ones smaller and sessile or nearly so; leaflets rather narrowly ovate and sharply long-pointed, base broad and often subcordate, margins coarsely and doubly sharp-toothed; leaflets on floral shoots usually smaller, acute or obtuse even on the same axis, and in many cases obtusely toothed: flowers several to many in open clusters on leafy shoots, pedicels slender, acicular and glandular, yet sometimes in little clusters on long thin primocanes, polygamous (mostly staminate or pistillate in various degrees, sometimes essentially perfect), variable in size and in shape of petals; in fertile flowers the petals may be as small as 5-7 mm. long and on other plants twice this length, not much if at all exceeding the calyx-lobes, usually blunt or rounded, closing over pistils at night and opening in sun; in staminate or sterile flowers the petals may be 2 cm. long, narrow-oblong to almost broad-linear, obtuse or acute, much separated: fruit ovoid, oblong or long-oblong, from 15 mm. long to 12 mm. broad to 25 mm. long and one-half as broad, black, drupelets not pilose.

Fields, banks, burned lands, woods margins, British Columbia, Washington, Oregon, as far south in California as Butte and Lake counties; often becomes a troublesome weedy plant in clearings. Type locality, "Valley of the Columbia, North-West America;" type specimen, Kew Herbarium, England.

Pomological varieties referable to *R. macropetalus* are Belle of Washington, Cazadero, Humboldt probably, Kosmoberry probably, Skagit Chief, Washington Climbing, Zelinski.